TRAFFIC ENGINEERING STANDARDS

CITY OF HUNTSVILLE
URBAN DEVELOPMENT DEPARTMENT
ENGINEERING DIVISION
TRAFFIC ENGINEERING AND OPERATIONS SECTION

JANUARY 2004 EDITION

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USAGE

For the purpose of these regulations, certain word, terms, and phrases shall be used, interpreted and defined as set forth in these standards. Definitions not expressly prescribed herein are to be construed in accordance with customary usage in municipal planning and engineering practice.

Unless the context clearly indicates to the contrary, words used in the present tense include the future tense; words used in the plural number include the singular; "shall" and "will" are always mandatory, "should" is an advisory condition, and "may" is permissive.

AASHTO: American Association of State Highway and Transportation Officials.

Acceleration Lane: A speed change lane, including tapered areas, for the purpose of enabling a vehicle entering a roadway to increase its speed to a rate at which it can more safely merge with through traffic.

Access: Driveway or other point of access such as a street, road, or highway that connects to the general street system. Where two public roadways intersect, the secondary roadway will be the access.

Alley: A public or private way having a narrow right-of-way and affording a secondary means of access to abutting properties.

Apartment: See Dwelling, Multiple Family.

Approach: The portion of an intersection leg that is used by traffic approaching the intersection.

Average Daily Traffic (ADT): An average 24-hour traffic volume at a given location for some period of time less than a year.

Band Width: The time in seconds or the percent of cycle between a pair of parallel lines which delineate progressive movement on a time-space diagram. It is a quantitative measurement of through traffic capacity provided by signal progression.

Capacity: The maximum hourly rate of vehicles that have a reasonable expected to pass a given point during a given time period under prevailing roadway, traffic, and control conditions.

City: The City of Huntsville, Alabama.

City Engineer: The duly designated city engineer for the City of Huntsville, Alabama.

City Traffic Engineer: The duly designated traffic engineer for the City of Huntsville, Alabama.

Civil Engineer: An engineer whose training or occupation is in the practice of civil engineering and who is a Registered Professional Engineer in the State of Alabama.

Civil Engineering: The application of the knowledge of the forces of nature, principles of mechanics and the properties of materials to the evaluation, design and construction of civil works for the beneficial use of mankind.

Critical Volume: A volume (or combination of volumes) for a given street which produces the greatest utilization of capacity for that street in terms of passenger cars or mixed vehicles per hour.

Cul-de-Sac: A local street with only one outlet and having an appropriate terminal for the convenient reversal of traffic movement.

Cycle Length: The total time, in seconds, for the traffic signal to complete one complete sequence of signal indications.

Deceleration Lane: A speed change lane, including tapered areas, for the purpose of enabling a vehicle that is to make an exit turn from a roadway to slow to a safe turning speed after it has left the main stream of faster moving traffic.

Delay: Measure of effectiveness to evaluate interrupted-flow facilities. There are two types primarily used: a) Stopped-time delay is the amount of time a vehicle spends stopped while traversing a given segment of highway facility. Primarily used for intersections; b) Travel-time delay includes stopped-time delay plus delay due to traveling at a slower speed than desired.

Design Hour Volume: Hourly traffic volume used for street design and capacity analysis, usually one or more peak hours during a 24 hour period.

Design Speed: The speed selected and used for correlation of the physical features of a highway that influence vehicle operation.

Design Vehicle: Developments intended for public use must be designed for the following types of vehicles:

Residential	SU30
Commercial Uses	WB60
Industrial Uses	WB67

Definitions for the above vehicle types are found in AASHTO A Policy on Geometric Design of Highways and Streets.

Divided Highway: A highway with separated roadways for traffic in opposite directions, such separation being indicated by depressed dividing strips, raised curbing, traffic islands, other physical separations, or by standard pavement markings and other traffic control devices.

Duplex: See Dwelling, Two Family.

Dwelling, Multiple Family: A residence occupied by three (3) or more families, with separate housekeeping and cooking facilities for each.

Dwelling, Single Family: A detached residence occupied by one (1) family.

Dwelling, Two Family: A residence occupied by two (2) families only, with separate housekeeping and cooking facilities for each.

Expressway: A multi-lane divided highway for through traffic with full control of access and with grade separations at street intersections.

Fire Trucks: Must be considered as a SU40 truck with a minimum 42 ft. radius for design purposes.

Geometric Design Standards: The standards and specifications adopted by the American Association of State Highway and Transportation Officials (AASHTO) and as amended.

Grade: Rate or percent of change in slope, either ascending or descending from or along the highway. It is measured along the centerline of the highway or access.

Green Time: The time within a given phase during which the green indication is shown (in seconds).

Hourly Volume: See Volume.

Huntsville Utilities: The Huntsville Water, Gas, and Electric Distribution System.

Intersection Sight Distance: The length of roadway visible to the driver of vehicle at an intersection. This distance permits a passenger vehicle to accelerate, traverse and clear the approaching lane of traffic, or permits a passenger vehicle to enter the flow of traffic and obtain 85 percent of design speed.

Interval: In signalization, a period of time during which all signal indications remain constant.

Level of Service (LOS): A qualitative measure describing the operational conditions within a traffic stream. It is used to qualitatively describe both intersections and roadway segments, using vehicle stopped delay and average travel speed, respectively, as measure of effectiveness.

Local Street: A street not classified in a higher system primarily providing access to abutting land and access to higher systems. Such street offers the lowest level of mobility, and service to through traffic is deliberately discouraged.

Lot: A parcel of land. For the regulatory purposes of this standard a lot may consist of a single lot of record, a portion of a lot of record, combinations of adjacent individual lots and/or portions

of lots, or a parcel described by metes and bounds.

Major Arterial: A street or highway of great continuity designed to accommodate the highest traffic volumes and longest trip desires. Service to abutting land uses is subordinate to provision of travel service to major traffic movements. Major arterials carry the major portion of trips entering, leaving, or bypassing the urban area.

Major Collector: A street of reasonable continuity that channels traffic between arterials, and from other collector streets to the arterial system. Such a street may sustain retail or other commercial establishments along its route and may carry relatively high traffic volumes.

Major Street Plan: The Major Street Plan as adopted by the Planning Commission as an element of the city Master Plan.

Master Plan: Any legally adopted part or element of the Master Plan of the City of Huntsville or its environs. This may include, but is not limited to: Zoning Ordinance, Zoning Ordinance, Subdivision Regulations, Major Street Plan, Capital Improvements Plan, and Land Use Plan.

Minor Arterials: Streets and highways of considerable continuity interconnecting with and augmenting the principal arterial system and providing service to moderate length trips at a somewhat lower level of mobility. The system places more emphasis on land access and distributes traffic to smaller geographic levels than those identified with the higher system. Minor arterials include all arterials not classified as major.

Minor Collector: A street, which carries traffic from a number of local streets to the major collector/arterial system, between other collectors, and from activity centers to a street of higher classification. Minor collectors generally have lower traffic volumes, shorter trip lengths and fewer through trips than major collectors. Minor collectors include all collectors not classified as major.

MUTCD: Manual of Uniform Traffic Control Devices.

Parking Space: An off-street space, enclosed or unenclosed, containing not less than 180 square feet of area exclusive of driveways appurtenant thereto, permanently reserved for the temporary storage of one(1) motor vehicle and connected without obstruction to a street or alley by a driveway.

Phase: In signalization, the part of a cycle allocated to any combination of traffic movements receiving the right-of-way simultaneously during one or more intervals.

Planning Commission: The Planning Commission for the City of Huntsville, Alabama.

Private Access Way: A private vehicular thoroughfare permanently reserved in order to provide a means of access to more than one lot, all having frontage on a public or private street.

Rear Service Road: See Alley.

Regulation: A requirement established by code, law, or ordnance.

Right-of-Way: A strip of land occupied or intended to be occupied by a street, off-street pedestrian walkway, railroad, road, electric transmission line, oil or gas pipeline, water main, sanitary or storm sewer main, or for another special use. The usage of the term "right-of-way" for land platting purposes shall mean that every right-of-way hereafter established and shown on a final plat is to be separate and distinct from the lots or parcels adjoining such right-of-way and not included within the dimensions or areas of such lots or parcels. Rights-of-way intended for streets, crosswalks, water mains, sanitary sewers, storm drains, or any other use involving maintenance by a public agency shall be dedicated to public use by the maker of the plat on which such right-of-way is established.

Sight Distance: See Intersection Sight Distance, Stopping Sight Distance.

Signal Progression: A time relationship between adjacent signals permitting continuous operation of groups of vehicles at a planned rate of speed.

Site: Any lot or parcel of land or contiguous combination thereof, under the same ownership, including joint ownership, where clearing and/or earthwork is proposed, performed or permitted.

Site Plan: A scaled plan showing all dimensions of parking, aisles, drives, access points, etc.

Speed Change Lane: A separate lane for the purpose of enabling a vehicle entering or leaving a roadway to increase or decrease its speed to a rate at which it can more safely merge or diverge with through traffic. Acceleration and deceleration lanes are speed change lanes.

Stopping Sight Distance: The distance traveled by the vehicle from the instant the driver of a vehicle sights an object necessitating a stop, to the instant the brakes are applied, and the distance required to stop the vehicle from the instant brake application begins.

Storage Lane: Additional lane footage added to a deceleration lane to store the maximum number of vehicles likely to accumulate during a critical period without interfering with the through lanes.

Street: Any public or private way set aside for common travel.

Street Frontage: All the property on one side of a street between two intersecting streets (crossing or terminating), or if the street is dead ended, then all of the property abutting on one side between an intersecting street and the dead end of the street. In no case shall the terminal end of a dead ended street be construed as street. For the purposes of this definition, a cul-de-sac is not considered a dead end street.

Subdivider: The person(s), firm(s), or corporation(s) owning land in the process of creating a subdivision or having completed a subdivision of said lane. Includes any agent of the subdivider.

Subdivision: The division of a lot, tract or parcel of land into two or more lots, plats, sites or other divisions of land for the purpose, whether immediate or future, of sale or of building development

of if a new street is involved. The term "subdivision" includes resubdivision and, when appropriate to the context, relates to the process of subdividing or to the land or territory subdivided.

Subdivision Regulations: Subdivision Regulations of the City of Huntsville adopted February 6, 1964, or as may be revised or amended from time to time.

Time Space Diagram: A two-dimensional plot of signal indications as a function of time for two or more signals along an arterial, with the separation distances scaled. One axis represents time, and the other axis represents signal separation distance.

Traffic Engineer: An engineer who applies the theories and practices of traffic engineering and who is a Registered Professional Engineer in the State of Alabama.

Traffic Engineering: That phase of civil engineering which deals with the planning, geometric design and traffic operations of roads, streets and highways, their networks, terminals, abutting lands and relationships with other modes of transportation for the achievement of safe, efficient and convenient movement of persons and goods.

Transportation Engineering: See Traffic Engineering.

Trip: A one-way vehicular/pedestrian/bicycle movement from an origin to a destination.

Volume: The total number of vehicles that pass over a given point or section of a lane or roadway during a given time interval. Volumes may be expressed in terms of annual, daily, hourly, or subhourly periods.

Zoning Ordinance: The Zoning Ordinance of the City of Huntsville, Alabama.

1. FOREWORD

The standards contained herein regulate all improvements, public and private, that impact transportation facilities within the City of Huntsville. They are intended to provide for adequate, coordinated, modern development with required facilities to serve and protect the potential users of the various areas of the community.

A failure to meet minimum standards creates a deficiency with resulting high user costs and losses. The high costs of maintenance necessitate that the construction of structural sections be done with adequate standards to minimize maintenance costs. These standards are intended to keep operating costs on public facilities at a reasonable level by obtaining proper alignments and structural sections.

It is recognized that certain projects financed wholly or in part with state or federal funds are subject to the standards prescribed by those agencies. Such standards may be greater or less than the City of Huntsville Traffic Engineering Standards.

The Traffic Engineering Standards contained herein provide adopted standards for frequently raised construction and development issues. They are aimed at ensuring consistent Traffic Engineering practices in new development or redevelopment of land uses in the City of Huntsville. Some of the material contained in this Standard has been drawn from previous City of Huntsville regulations as well as the City of Huntsville Zoning Ordinance, the City of Huntsville Subdivision Regulations, the City of Huntsville Standard Specifications and nationally established texts.

These standards are meant to apply rigidly to new developments that are not constrained by already existing improvements. This standard is not to be applied, without qualification, to infill development. Infill development in an urban area is often constrained by existing improvements. To the extent deemed possible by the City, infill developments will be required to match these standards. The City may allow modification of these standards when necessary to allow private and public construction that is compatible with surrounding in-place improvements.

It is the intent that these standards will apply to State Highways within the City of Huntsville. Whenever the Standards of the Alabama Department of Transportation exceed the standards contained herein, such standards will take precedence.

2. TRANSPORTATION IMPACT STUDIES

2.1 Responsibilities for Transportation Impact Studies

Transportation impact studies may be required by the City in order to adequately assess the impacts of a development proposal on the existing and/or planned street system. The primary responsibility for assessing the traffic impacts associated with a proposed development will rest with the developer, with the City serving in a review capacity.

This study will be the responsibility of the applicant and shall be prepared by a licensed professional engineer, who has specific training in traffic and transportation engineering, and shall be approved by the Traffic Engineer.

Upon submission of a draft traffic study, the City will review the study data sources, methods, and findings. Comments will be provided in a written form. The developer and the project engineer will then have an opportunity to incorporate necessary revisions prior to submitting a final report. All studies shall be approved by the City before acceptance.

Typically, staff will attempt to review any first submittal traffic study within 10 working days of the date of submittal to the City's Traffic Engineering Division office. If study revisions are needed, staff will normally review these within 5 working days of the date of submittal. Longer time periods may be necessary if the Alabama Department of Transportation is involved in the review process.

A transportation impact study shall be performed, unless waived by the Traffic Engineer. A written study meeting the City criteria, contained in this standard, shall be required for a development proposal when trip generation during the peak hour is expected to exceed 100 vehicles as determined by the City. A study may be required when a project impacts an existing congested or high-accident location, or where specific site access and safety issues are of concern.

The following development submittals shall require traffic studies:

1) All developments with a trip generation during the peak hour in excess of 100 vehicles as determined by the City. A list of developments which may produce a peak hour trip generation of 100 or more vehicles may be found in Appendix A.

2) Any change of use which would increase the trip generation during the peak hour in excess of 100 vehicles as determined by the City. (For definition of "Change in Use," see section 3.1.)

3) A rezoning application when the proposed zoning will increase the trip generation during the peak hour in excess of 100 vehicles as determined by the City.

4) When an additional access from a City or State roadway to an existing use is being requested and the City or State does not consider the access necessary for safe and efficient movement of traffic. In this case, the developer shall be responsible for providing

the City or State the necessary transportation engineering study justifying the need for such access.

A waiver of the transportation impact study may be granted by the Traffic Engineer under the following conditions:

1) Where sufficient data exist within the Traffic Engineering Division files to prevent the need for such study, or

2) Where a similar development exist which is approximately the same size and/or character, which has previously, within two years, completed a transportation impact study, or

3) Where no specific site access or safety issues exists for the site, as determined by the Traffic Engineer.

All previous traffic studies relating to the development that are more than two years old, will have to be updated, unless the City determines that conditions have not changed significantly.

Where access points are not defined or a site plan is not available at the time the traffic study is prepared, additional traffic work may be required when a site plan becomes available or the access points are defined.

The applicant will be notified at the pre-planning stage if a traffic study will be required, provided sufficient information is available for the City to determine whether the trip generation criterion has been met. If insufficient information is available but the property appears to involve a sufficiently intense land use, the applicant will be informed that a traffic study is required.

Transportation consultants are required to discuss projects with the City prior to starting the study. As a minimum, topics for possible discussion at such meetings will include trip generation, directional distribution of traffic, trip assignment, definition of the study area, intersections requiring critical lane analysis, and methods for projecting build-out volume. This will provide a firm base of cooperation and communication between the City, the owner or developer and the project's consultants in creating future traffic characteristics which realistically define traffic movement associated with the proposed development. Specific requirements will vary depending on the site location.

2.2 Traffic Study Format

In order to provide consistency and to facilitate staff review of traffic studies, the following format should be followed in the preparation of such studies by transportation consultants. Sections that are not applicable to the specific study are not required.

2.2.1 Introduction

The introduction portion of the report should contain the following:

a. Land Use, Site and Study Area Boundaries

A brief description of the size of the land parcel, general terrain features, the location with the jurisdiction and the region should be included in this section. In addition, the roadways that afford access to the site, and are included in the study area, should be identified.

The exact limits of the study area should be based on engineering judgment, and an understanding of existing traffic conditions surrounding the site. In all instances, however, the study area limits shall be mutually agreed upon by the Developer, his engineer, and the City. These limits will usually result from initial discussions with staff. A vicinity map that shows the site and the study area boundaries, in relation to the surrounding transportation system, shall be included.

b. Existing and Proposed Site Uses

The existing and proposed uses of the site shall be identified in terms of the various zoning categories of the City. In addition, the specific use for which the request is being made shall be identified if know, since a number of uses may be permitted under the existing ordinances. It will be the intent of the traffic study to evaluate the worst case traffic impacts for the proposed development allowed by the zoning. If several different uses are permitted by the zoning, the highest trip generation uses shall be assumed for the study.

c. Existing and Proposed Uses in Vicinity of Site

A complete description (including a map) of the existing land uses in the study area as well as their current zoning and use, shall be included. In addition, all vacant land within the study area and its assumed future uses shall be identified. This latter item is especially important where large tracts of undeveloped land are in the vicinity of the site, and within the prescribed study area. Generally much of this information can be obtained from the City's Planning Department staff.

d. Existing and Proposed Roadways and Intersections

Within the study area, the applicant shall describe and provide volumes for existing roadways and intersections including geometries and traffic signal control as well as improvements contemplated by government agencies. This would include the nature of the improvement project, its extent, implementation schedule, and the agency or funding source responsible. A map shall be provided showing the location of such facilities.

2.2.2 Trip Generation and Design Hour Volumes

A summary table listing each type of land use, the size involved, the average trip generation rates used (total daily traffic and a.m./p.m. peaks), and the resultant total trips generated shall be provided.

Trip generation shall be calculated from the latest data contained within the Institute of Transportation Engineer's (ITE) Trip Generation Manual. In the event that data is not available for the proposed land use, the City shall approve estimated rates prior to acceptance.

The calculation of design hour volumes used to determine study area impacts must be based on:

a. Peak hour trip generation rates as published in the ITE Trip Generation Summary.

b. NCHRP Report 187 where justified.

c. Traffic volume counts for similar existing uses, if no published rates are available.

d. Additional sources from other jurisdictions if acceptable to the City.

Use of the following percentage rates to account for passerby traffic may be considered upon approval of the City. Internal trip reductions and modal split assumptions will require analytical support to demonstrate how the figures were derived and will require approval by the City.

2.2.3 Trip Distribution

The estimates of percentage distribution of trips from the proposed development to destinations in the metro region shall be clearly stated in the report using the north, south, east, west compass points. Market studies and information concerning origin of trip attractions to the proposed development may be used to support these assumptions where available. A map showing the percentage of site traffic on each street shall be provided as part of the traffic study graphic material.

Land Use	Passerby Component
Banks	**14%**
Regional Shopping Centers	**10%**
Supermarkets	**28%**
Hardware Stores	**8%**
Convenience Stores	**16%**
Drive-In Restaurants	**50%**
Service Stations	**50%**
Auxiliary Commercial Uses	**16%**

Table 2-1
Passerby Factors

2.2.4 Trip Assignment

The direction of approach of site generated traffic via the area's street system will be presented in this section. The technical analysis steps, basic methods, and assumptions used in this work shall be clearly stated and agreed to by the City. The assumed trip distribution and assignment shall represent the most logically traveled routes for drivers accessing the proposed development. These routes can be determined by observation of travel patterns to existing land uses in the study area.

2.2.5 Existing and Projected Traffic Volumes

Graphics shall be provided which show the following traffic impacts for private access points, intersections and streets.

a. A.M. peak hour site traffic (in and out) including turning movements.

b. P.M. peak hour site traffic (in and out) including turning movements.

c. A.M. peak hour total traffic including site generated traffic (in and out). These volumes shall include through and turning movement volumes for current conditions and a separate set of numbers that also include 20 year projections or build out (whichever is specified by the City).

d. P.M. peak hour traffic total including site generated traffic (in and

out). These volumes shall include through and turning movement volumes for current conditions and a separate set of numbers that also include 20 year projections or build out (whichever is specified by the City).

e. Any other peak hour which may be critical to site traffic and the street system in the study area should be included in the graphics and show the same information as is provided for the A.M./P.M. peak hours.

f. Actual counts of existing total daily traffic for the street system in the study area at the time the study is being prepared.

g. Projected total daily traffic for the street system in the study area based on traffic from the proposed development and counts of existing daily traffic obtained in item f.

h. Projected total daily traffic for the street system in the study area based on traffic from the proposed development, counts of existing daily traffic obtained in item f. above, and traffic projections based on build out of land use within the study area or a 20 year projection (whichever is specified by the City).

All raw traffic count data (including average daily volumes and peak hour turning movements) and analysis worksheets shall be provided in the appendices of the report. Computer techniques, and the associated printouts, may be used as part of the report.

Volume projections for background traffic growth will be provided by the City, or alternatively a method for determining these volumes will be recommended by the City.

All total daily traffic counts shall be actual machine counts and not based on factored peak hour sampling. Latest available machine counts from the Alabama Department of Transportation, the City, and other agencies may be acceptable if not more than two years old.

2.2.6 Level of Service

Level of service C will be the design objective for all movements and under no circumstances will less than level of service "D" be accepted for site and non-site traffic including existing traffic at build out of the study area. The design year will be approximately 20 years following construction and include volumes generated by build-out of the study area or a 20 year projection in background traffic (whichever is specified by the City).
The following interpretations of "Level of Service" have been provided:

Level of Service A. A condition of free flow with low traffic density, where no vehicle waits longer than one signal cycle.

Level of Service B. A stable flow of traffic where only a rate occasion do drivers wait through more than one signal cycle.

Level of Service C. Still in the zone of stable flow, but intermittently drivers must wait through more than one signal cycle and backups may develop behind left turning vehicles.

Level of Service D. Approaching instability, drivers are restricted in their freedom to change lanes and delays for approaching vehicles may be substantial during peak hours.

Level of Service E. Traffic volumes are near or at the capacity of the arterial, and long queues of vehicles may create lengthy delays especially for left turning vehicles.

Level of Service F. Congested condition of forced traffic flow, where queued backups from locations downstream restrict or prevent movement of vehicles out of the approach, creating a storage area during part or all of the peak hour.

Maximum sums of critical lane volumes for determining levels of service using the Critical Lane Planning Analysis Technique are provided in Appendix 11.4.

2.2.7 Capacity Analysis

A capacity analysis will be conducted for all public street intersections impacted by the proposed development and for all private property access points to streets adjacent to the proposed development as specified in the traffic study requirements form and within the limits of the previously defined study area. The a.m., p.m., and any other possible peak period will be tested to determine which peak hours need to analyzed. Capacity calculations should also include an analysis for 20th year projections or study area build out conditions. The capacity analysis calculations should be based on the planning analysis techniques contained in TRB 212, "Interim Materials on Highway Capacity" or subsequent highway capacity techniques established by the Federal Highway Administration. All capacity analysis work sheets shall be included in the appendices of the report.

2.2.8 Traffic Signals

The need for new traffic signals will be based on warrants contained in the Manual on Uniform Traffic Control Devices, warrants contained herein, and any additional warrants established by the National Committee on Uniform Traffic Control Devices. In determining the location of a new signal, traffic progression is of paramount importance. Generally a spacing of one-half mile for all signalized

intersections should be maintained. This spacing is usually desirable to achieve good speed, capacity, and optimum signal progression. Pedestrian movements shall be considered in the evaluation and adequate pedestrian clearance provided in the signal cycle split assumptions.

Warrant 1, Minimum Vehicular Volume, ADT

Minimum Vehicular Volume$_{ADT}$ Warrants for Warrant 1

Number of lanes for moving traffic on each approach		Vehicles on major street (total of both approaches)	Vehicles higher-volume minor-street approach (one direction only)
Major Street	Minor Street		
1.....	1.....	9000	2700
2 or more.....	1.....	11000	2700
2 or more.....	2 or more.....	11000	3500
1.....	2 or more.....	9000	3500

Warrant 2, Interruption of Continuous Traffic, ADT

Minimum Vehicular Volume$_{ADT}$ Warrants for Warrant 2

Number of lanes for moving traffic on each approach		Vehicles major street (total of both approaches)	Vehicles higher-volume minor-street approach (one direction only)
Major Street	Minor Street		
1.....	1.....	13500	1400
2 or more.....	1.....	16000	1400
2 or more.....	2 or more.....	16000	1800
1.....	2 or more.....	13500	1800

To provide flexibility for existing conditions and ensure optimum two-way signal progression, an approved traffic engineering analysis shall be made to properly locate all proposed accesses that may require signalization. The section of roadway to be analyzed for signal progression will be determined by the City and will include all existing and possible future signalized intersections.

The progression pattern calculations should use a cycle consistent with the signal timing policy of the City. A desirable bandwidth of 50% of the signal cycle should be used where existing conditions allow. Where intersections have no signals presently, but are expected to have signals, typically a 60% mainline, 40% cross street cycle split should be assumed. Cycle split assumptions must relate to volume assumptions in the capacity analysis of individual techniques are used, they must be of the type which utilize turning movement volume data and

pedestrian clearance times in the development of time/space diagrams. The green time allocated to the cross street will be considered no less than the time which is required for a pedestrian to clear the main street using Manual on Uniform Traffic Control Devices standards. Those intersections which would reduce the optimum bandwidth if a traffic signal were installed may be required by the City to remain unsignalized and have turning movements limited by access design or median islands.

2.2.9 Traffic Accidents

Traffic accident data for affected street corridors may be required for the study. Such locations will be specified by the City. Where this is necessary, estimates of increased or decreased accident potential must be evaluated for the development, particularly if the proposed development might impact existing traffic safety problems in the study area, and safety improvement recommended where necessary.

2.2.10 Noise Attenuation

If a residential development is planned adjacent to a freeway or arterial roadway, the need for noise attenuation measures may be required as part of the impact analysis. It is recommended that the need for noise attenuation measures be determined using the methods outlined in "Guide on Evaluation and Abatement of Traffic Noise, AASHTO, 1993.

2.2.11 Conclusions

This chapter of the report must be a clear, concise description of the study findings. It is anticipated that this conclusion chapter will serve as an executive summary.

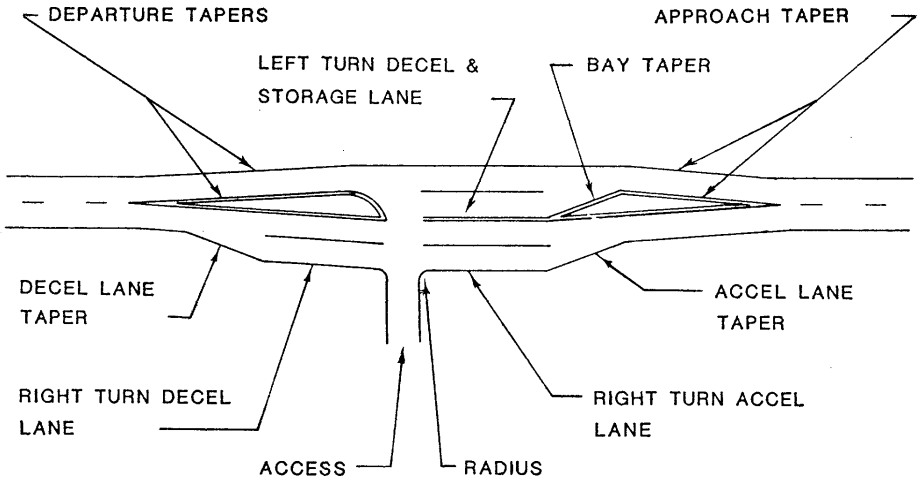
2.2.12 Recommendations

In the event that analysis indicates unsatisfactory levels of service on study area roadways, a description of proposed improvements to remedy deficiencies should be included. These proposals would include projects by the City or the State Department of Transportation for which funds have been appropriated and obligated. The use of all future roads in an analysis will require approval from the City. In general, the recommendation section should include:

a. Proposed Recommended Improvements - This section should describe the location, nature, and extent of proposed improvements to assure sufficient roadway capacity. A sketch of each improvement similar to Figure 2-1 should be provided showing the length, width and other pertinent geometric features of the proposed improvements.

b. Volume/Capacity Analysis at Critical Points - Another iteration of the volume/capacity analysis must be described, which demonstrates the anticipated level of service as a result of making these improvements. This level of service shall be "D" or better.

c. Traffic Volume Proportions - Percentages based on the traffic impact analysis may be required by the City to determine the proportion of traffic using various public improvements (both existing and proposed) from several developments within the study area.



2.3 Revisions to Traffic Study

Revisions to the traffic study shall be provided as required by the City. The need to require revisions will be based on the completeness of the traffic study, the thoroughness of the impact evaluation and the compatibility of the study with the proposed access and development plan.

2.4 Design Capacities of Various Roadways

The following values should be used to determine the approximately number of lanes for a roadway. These values are the approximate roadway capacity; however, depending on the presence and spacing of intersections, the values maybe higher or lower. A traffic engineering study should be performed to determine the appropriate number of lanes for each roadway under design.

Description	Daily Capacity, vpd	Hourly Capacity, dhv
4 Lane Freeway	68,000	6,800
6 Lane Freeway	102,000	10,200
8 Lane Freeway	136,000	13,600
10 Lane Freeway	170,000	17,000
12 Lane Freeway	204,000	20,400
4 Lane Expressway	50,000	5,000
6 Lane Expressway	75,000	7,500
8 Lane Expressway	100,000	10,000
2 Lane Arterial Urban	14,000	1,400
2 Lane Arterial Rural	18,000	1,800
3 Lane Arterial Urban	17,500	1,750
3 Lane Arterial Rural	22,500	2,250
4 Lane Arterial Urban	26,000	2,600
4 Lane Arterial Rural	28,000	2,800
5 Lane Arterial Urban	26,500	2,650
5 Lane Arterial Rural	32,500	3,250
6 Lane Arterial Urban	44,000	4,400
7 Lane Arterial Urban	48,000	4,800
8 Lane Arterial Urban	55,000	5,500
2 Lane Collector Urban	11,000	1,100
2 Lane Collector Rural	14,000	1,400
3 Lane Collector Urban	13,700	1,370
3 Lane Collector Rural	17,500	1,750
4 Lane Collector Urban	18,000	1,800
5 Lane Collector Urban	23,000	2,300
2 Lane One Way	14,000	1,400
3 Lane One Way	18,000	1,800
4 Lane One Way	24,000	2,400
1 Lane Ramp One Way	9,000	900
2 Lane Ramp One Way	18,000	1,800
3 Lane Ramp One Way	27,000	2,700
Local Residential	2,500	250

3. ACCESS CONTROL

3.1 Access Permit

Prior to the construction of any access drive, a permit shall be obtained from the Traffic Engineer. The application shall contain such site, location and condition information as the Traffic Engineer shall deem necessary or desirable in order to determine whether or not the application is for work that is acceptable and in conformance with these standards and other applicable City standards.

a. Commercial Accesses -- Applications for permit to construct, reconstruct, alter, remove or replace any commercial driveway approach, or any curb, gutter, or sidewalk in connection therewith shall be made to the Traffic Engineer. A plot plan shall be required and made a part of the application.

b. Residential Accesses -- Applications for permit to construct, reconstruct, alter, remove or replace any commercial driveway approach, or any curb, gutter, or sidewalk in connection therewith shall be made to the Traffic Engineer. A plot plan shall be required and made a part of the application. The Traffic Engineer may pre-approve single family residential platted lots, by a note and detail on the approved subdivision plat.

3.2 Change in Property Use

When there are changes in property use which result in changes in the type of access operation, and the access is not in conformance with these standards, the City or State may require reconstruction, relocation or conformance of the access to these standards when any of the following access change criteria occur or will occur as a result of changes in property use:

a. The use of the access increases in actual or proposed vehicular volume by 20%.

b. A particular directional characteristic (such as left turns) increases by 20%.

c. The change in use of the property or modifications to the property causes the flow of vehicles entering the property to be restricted or to queue or hesitate on the highway creating a hazard.

d. The use of the access by vehicles exceeding 30,000 pounds gross vehicle weight increases by 20% or by 10 vehicles per day.

e. If a parcel of land with existing access has been in a state of nonuse for more than two years, recommencement of access use will be considered a change in use. If the renewed use of the access exceeds its design limitations or is nonconforming with the present standard, a new permit may be required.

Change in property use may include but is not limited to: structural modifications, remodeling, change in type of business, expansion of an existing business, change in zoning, or change in property division creating new parcels. It does not include modifications in advertising, landscaping, general maintenance, or aesthetics that do not affect internal or external traffic flow or safety.

Any change in property use, meeting these criteria, shall obtain approval through the Traffic Engineer prior to execution.

3.3 General Access Requirements

The design, number, and location of access points shall be approved by the Traffic Engineer when the use of any property or its access operation is changed. A change of use is as defined in section 3.2 of this standard. The number of access points must be kept to a minimum. No access points will be approved without a site plan. The following information is presented as a general guideline for the location of access points to the public street system.

3.3.1 Provision of Access: The Traffic Engineer shall approve access point(s) based on traffic safety, operational needs and conformance to as much of the requirements of these standards as possible.

3.3.2 Number of Access Points: One access point per property ownership will be permitted, unless a site plan or traffic study approved by the Traffic Engineer shows that additional access points are necessary to adequately handle driveway volumes and will not be detrimental to traffic flow on adjacent public streets.

3.3.3 Vehicle Access: Will not be approved for parking or loading areas that require backing maneuvers in a public street right-of-way except for single family residential uses on local streets.

Where a proposed development includes a truck loading operation, and has access to a public street, adequate space must be provided such that all truck maneuvering is performed off street. Exceptions may be granted by the Traffic Engineer when the following is met:

a) the street is a cul-de-sac,
b) the street is of a width not less than 34 feet, back of curb to back of curb,
c) the street was designed and approved to allow for such maneuvering to occur.

3.3.4 Multi-Street Access: If a property has frontage on more than one street, access will be permitted only on those street frontages where standards contained herein and other City Regulations can be met.

3.3.5 Restriction of Turning Movements: Where necessary for the safe and efficient

movement of traffic, the Traffic Engineer may require access points to provide for only limited turning movements. The restriction of turning movements shall not affect the number and location of access points as specified in these standards.

3.3.6 Joint Access: Joint access may be required for two adjacent developments where a proposed new access will not meet the spacing requirement set forth in section 4.1 of this standard.

3.3.7 Abandoned Accesses: Existing driveways, even if not in use, shall not be relocated, altered, or reconstructed without approval from the Traffic Engineer.

3.3.8 Speed Change Lanes: For arterial and collector streets, the Traffic Engineer should require the provision of speed change lanes if the conditions specified in section 3.4 are met. For design standards, see section 5.8 for left turn movements and 5.9.2 for right turn movements.

3.3.9 Access for Special Exceptions/Variances:

Whenever a property applies for a special exception/variance which will generate more traffic than the existing residential use, the Traffic Engineer may require relocation of the access to a collector or local street frontage where possible. Whenever that is not possible, the Traffic Engineer may require joint access with adjacent properties in order to minimize arterial access. Whenever the Traffic Engineer determines that access cannot be safely provided or the applicant is not agreeable to the implement of alternatives aimed at providing safe access, the Traffic Engineer shall recommend to the Planning Commission and/or the Board of Zoning Adjustments that the special exception/variance be denied.

3.4 Speed Change Lanes

For both City Streets and State Highways, speed change lanes should be required according to the following unless a waiver is obtained from the State or the City waiving these provisions. For design standards, see section 5.9 of this standard.

3.4.1 Deceleration Lanes for Right Turning Vehicles

A speed change lane for right turning deceleration movements will be required for any access when traffic volumes at the access meet or exceed the values and criteria shown in Figures 3-1, and 3-2.

3.4.2 Acceleration Lanes for Right Turning Vehicles

A speed change lane for right turning acceleration movements will be required for any access when the traffic volume at the access meets or exceeds the values and criteria shown in Figures 3-3 and 3-4.

3.4.3 Deceleration Lanes for Left Turning Vehicles

A speed change lane for left turning movements will be required for any access when the traffic volume at the access meets or exceeds the values and criteria shown in Figures 3-5, 3-6, 3-7 and 3-8.

3.4.4 Acceleration Lanes for Left Turning Vehicles

The need for and use of a left turn acceleration lane is site specific. Factors such as highway speed, access volume, nearby access, existing highway auxiliary lanes, traffic control devices, available stopping sight distance, and other topographic and highway design factors are very influential. A left turn acceleration lane may be required if the values of Figures 3-6 and 3-7 are met and the Traffic Engineer determines that the lane would be a benefit to highway safety and operation.

3.4.5 Additional Speed Change Lane Criteria

a. Figures 3-1 through 3-8 are based on a truck (exceeding 30,000 pounds gross vehicle weight) percentage of less than 7%. If the access will have a larger percentage of vehicles exceeding 30,000 pounds gross vehicle weight, half the values in Figures 3-1 through 3-8 shall be used to require speed change lanes in the interests of public safety.

b. When higher left turning volumes, safety or traffic operations necessitate, the City or State may require double left turn design.

c. If the design of an access is within two different speed zones, the criteria for the higher speed zone shall apply.

d. When specific site conditions exist related to traffic safety, such as restricted sight distance, a speed change lane may be required, although the criteria as described in subsections 3.4.1 through 3.4.4 are not met.

e. Where there are three or more through lanes in the direction of travel, the requirement for right turn acceleration and deceleration lanes may be waived by the Traffic Engineer. Each case will be reviewed independently and a decision made based upon site specific conditions. Generally, lanes will be required only when a high volume access or a specific geometric safety problem exists.

3.5 Safeguards During Construction

All accesses must meet the requirements of section 7.3 for traffic control in construction work zones and must meet any requirements set forth in the Standard Building Code, as adopted by the city.

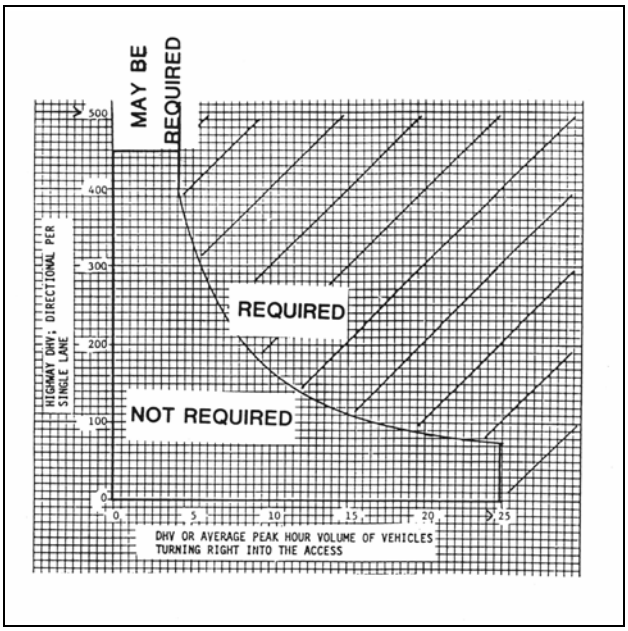


Figure 3-1
Volume Warrants for Right Turn
Deceleration Lanes 35 and 40 MPH

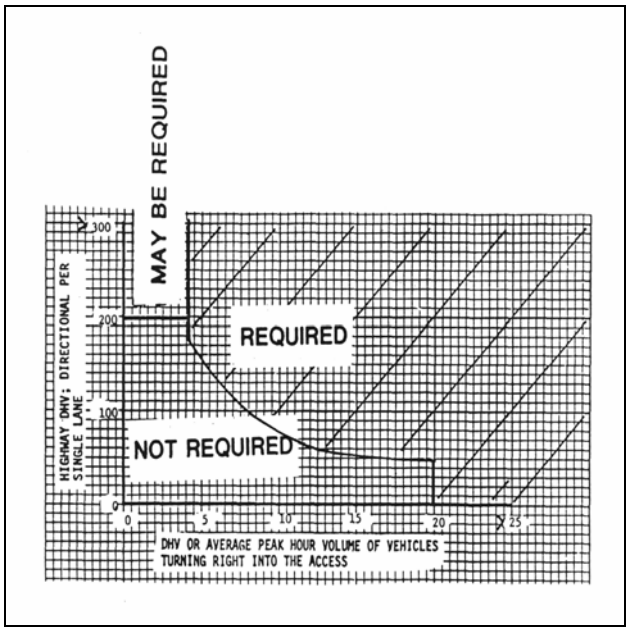


Figure 3-2
Volume Warrants for Right Turn
Deceleration Lanes 45 to 55 MPH

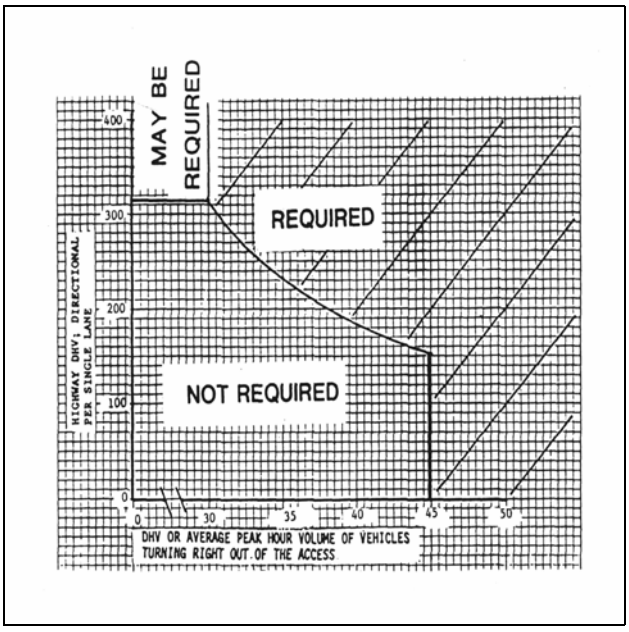


Figure 3-3
Volume Warrants for Right/Left Turn
Acceleration Lanes 40 MPH

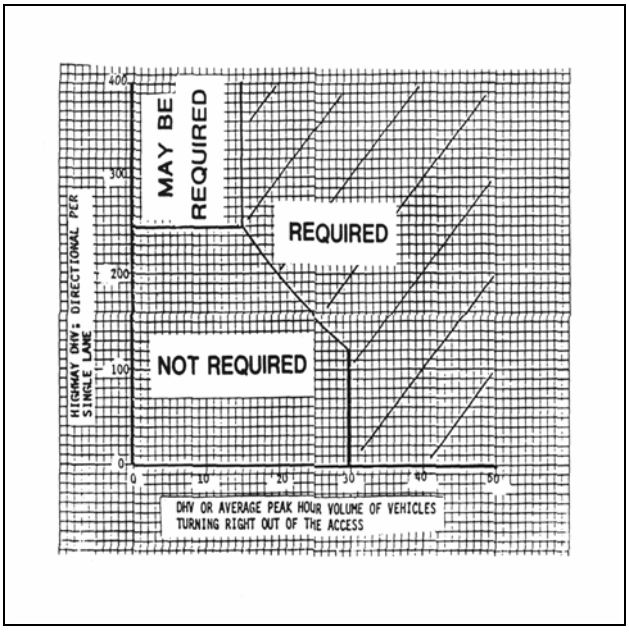


Figure 3-4
Volume Warrants for Right/Left Turn
Acceleration Lanes 45 to 55 MPH

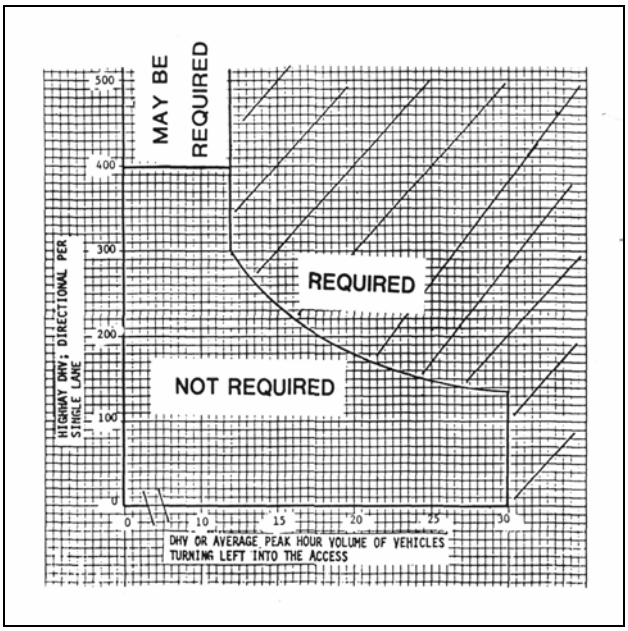


Figure 3-5
Volume Warrants for Left Turn
Deceleration Lanes 25 and 30 MPH

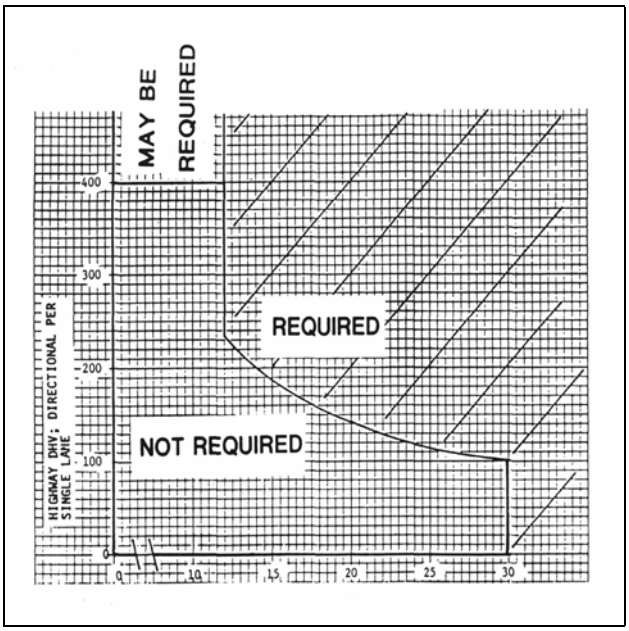


Figure 3-6
Volume Warrants for Left Turn
Deceleration Lanes 35 to 40 MPH

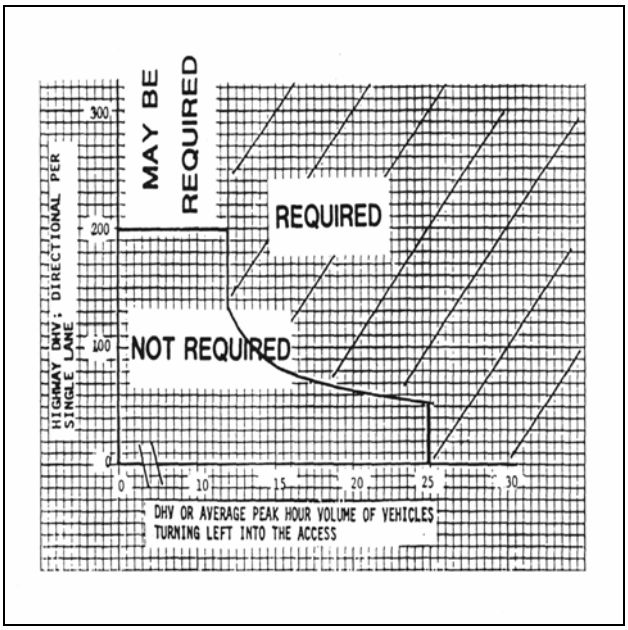


Figure 3-5
Volume Warrants for Left Turn
Deceleration Lanes 45 and 55 MPH

4. SITE ACCESS DESIGN

4.1 Spacing

Access spacing standards are shown in Figure 4-1. Where access locations are in closer proximity than the distances shown in Figure 4-1, joint access shall be considered.

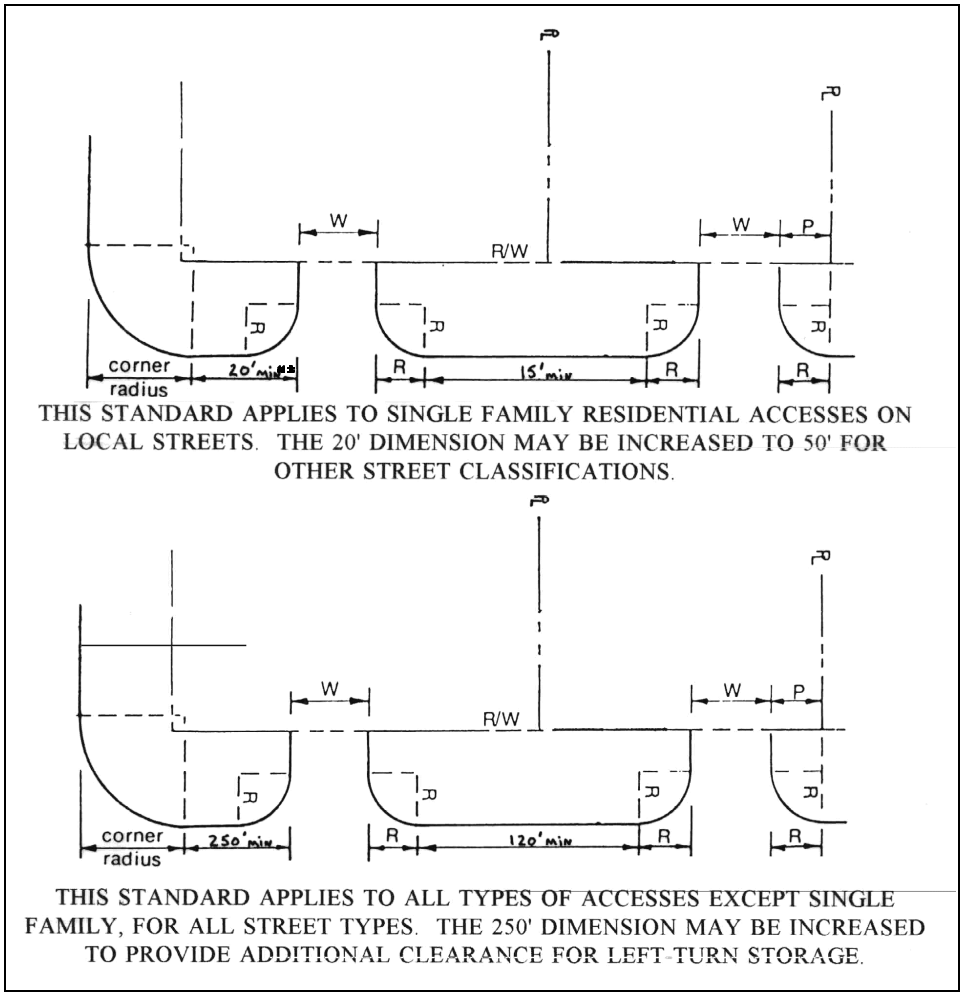


Figure 4-1
Access Spacing

4.2 Alignment

Where lots are not large enough to allow accesses on opposite sides of the street to be aligned, the center of driveways/streets not in alignment will normally be offset a minimum of 150 ft. on all collector and commercial/multi-family local streets; 300 ft. on all arterials. Greater distances may be required if left turn storage lanes require such. Minimum sight distance shall be provided at all access points as described in

Section 6.10, which applies to both public street and private access intersections. Exceptions to this section must be approved by the Traffic Engineer. Accesses must intersect a public street at 90E or as close to 90E as topography permits, but not less than 45E.

4.3 Design

4.3.1 Turning Restrictions

Figures 4-2 through 4-6 are the recommended minimum design for limited movement accesses. These are based on the turning characteristics of WB40 trucks. Acceleration and deceleration lanes may be required to be incorporated into the designs. The islands must be provided with a vertical curb. Additional right of way or easement may be required to accommodate these designs. The ends of the islands should typically be provided with 2 ft. flowline radii. Where site plans do not permit installation of islands in accesses as shown in Figures 4-2 through 4-6, to restrict left turn movements, the City may permit installation of a center median on the adjacent street as an alternative.

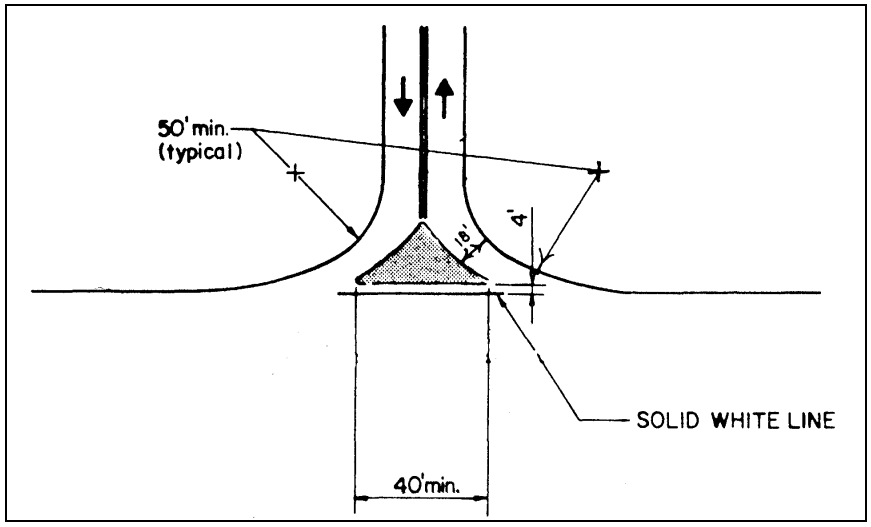


Figure 4-2
Right-In, Right-Out Access Design

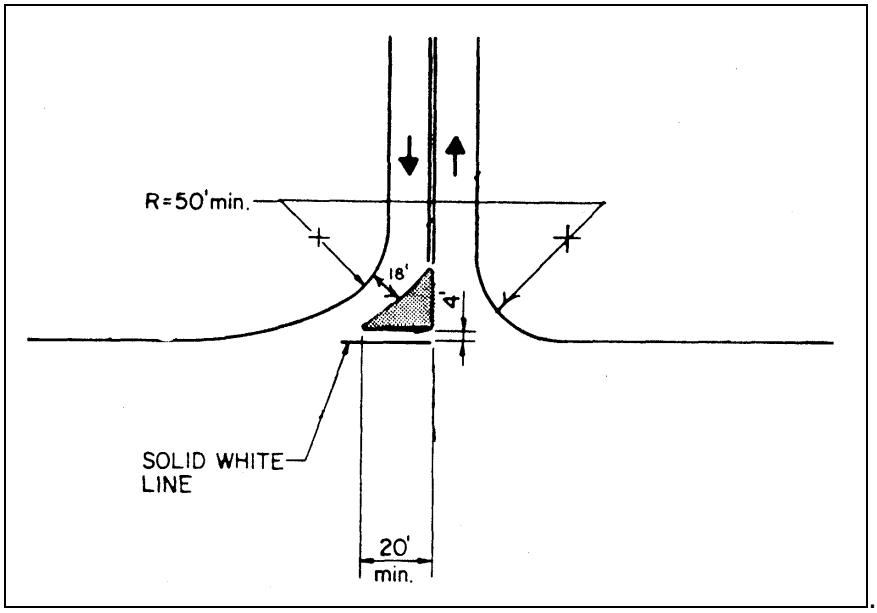


Figure 4-3
Right-In, Right-Out, Left-In Access Design

4.3.2 Radii and Widths

Radii type curb returns will be required by the City for accesses meeting the criteria summarized in Table 4-1 and wherever islands are constructed in the driveway to control turning movements. All radii are quoted in feet as measured along the flowline. A three-point curve radius may be used. These standards apply to accesses on State Highways and City Streets.

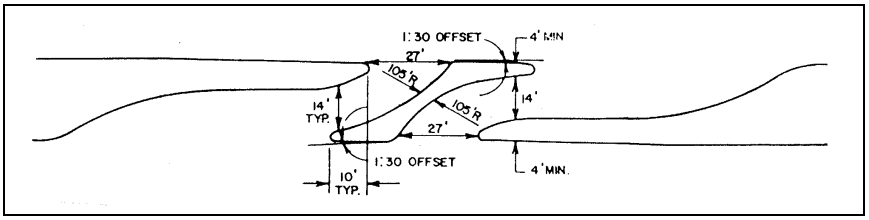


Figure 4-4
Right-In, Left-In Median Design

4.3.3 Maximum Grades

For maximum access grades, see Figure 4-8.

4.3.4 Sight Distance

For minimum sight distance at private accesses, see section 5.10 of this

standard.

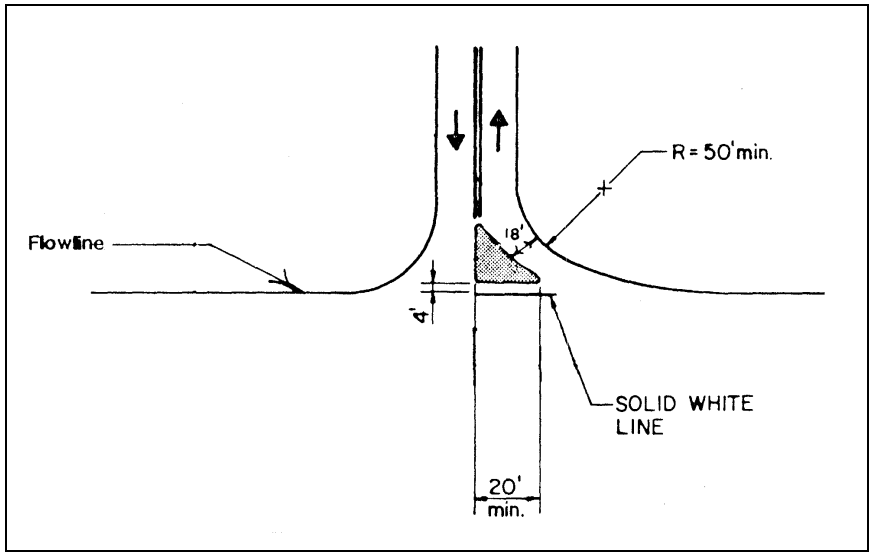


Figure 4-5
Right-In, Right-Out, Left-Out Access Design

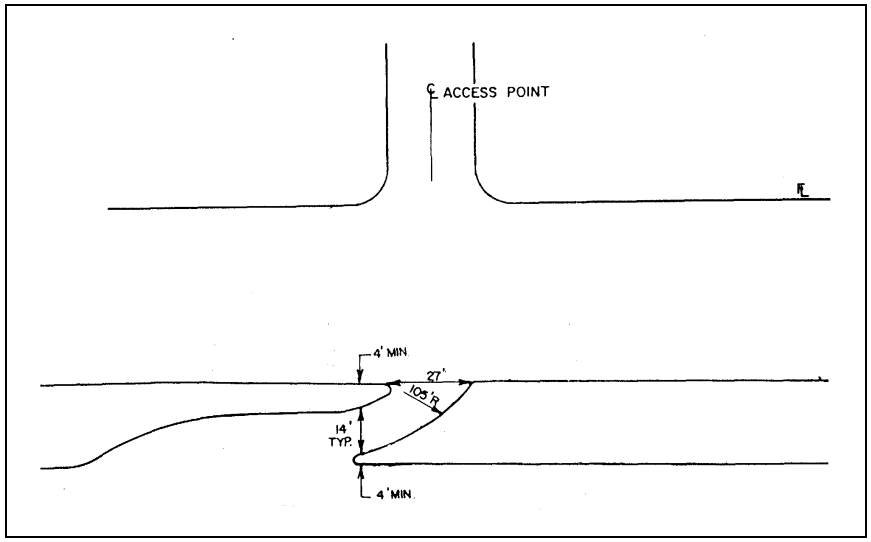


Figure 4-6
Median Design to Restrict Exiting Left Turns

4.3.5 Driveway and Parking Area Surface

The surface of the driveway connecting with the roadway sections shall slope down and away from the highway shoulder a sufficient amount and distance to preclude ordinary surface water drainage from the driveway area flowing onto the highway roadbed. Also the section from the edge of the roadway pavement to the right-of-way shall be paved of a material suitable to the City

Engineer.

Land Use Type	Minimum Width (One/Two Way)	Maximum Width (One/Two Way)	Minimum Return Radii	Maximum Return Radii
Residential - Single Family	8	15	3.5*	15
Residential - Duplex	8	22	15	25
Apartments	15	30	20	30
Commercial - Urban	15 / 20	25 / 35	20	30
Commercial - Suburban	15 / 20	25 / 35	20**	30
Commercial - Rural	15 / 20	25 / 35	20	35
Industrial	25	45	20	50

* 15' minimum if other than local street
** 15' if Cul-de-sac

Table 4-1
Access Widths and Radii

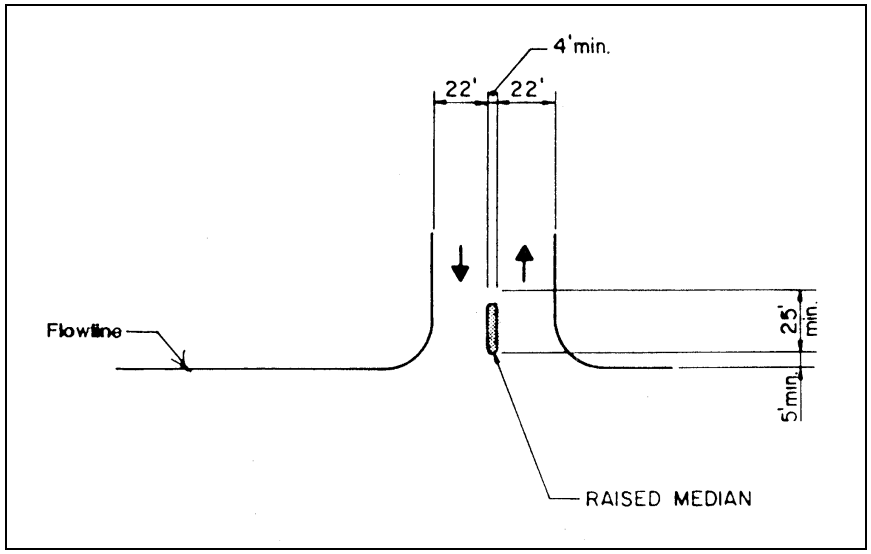


Figure 4-7
Access Design With Median Divider

The surface of the driveway and parking area shall be that of an all weather surface equivalent to four (4) inches of compacted dense graded base.

4.3.6 Drainage and Drainage Structures

a. All drainage and drainage structures shall meet the requirements set forth in the current Stormwater Management Ordinance.

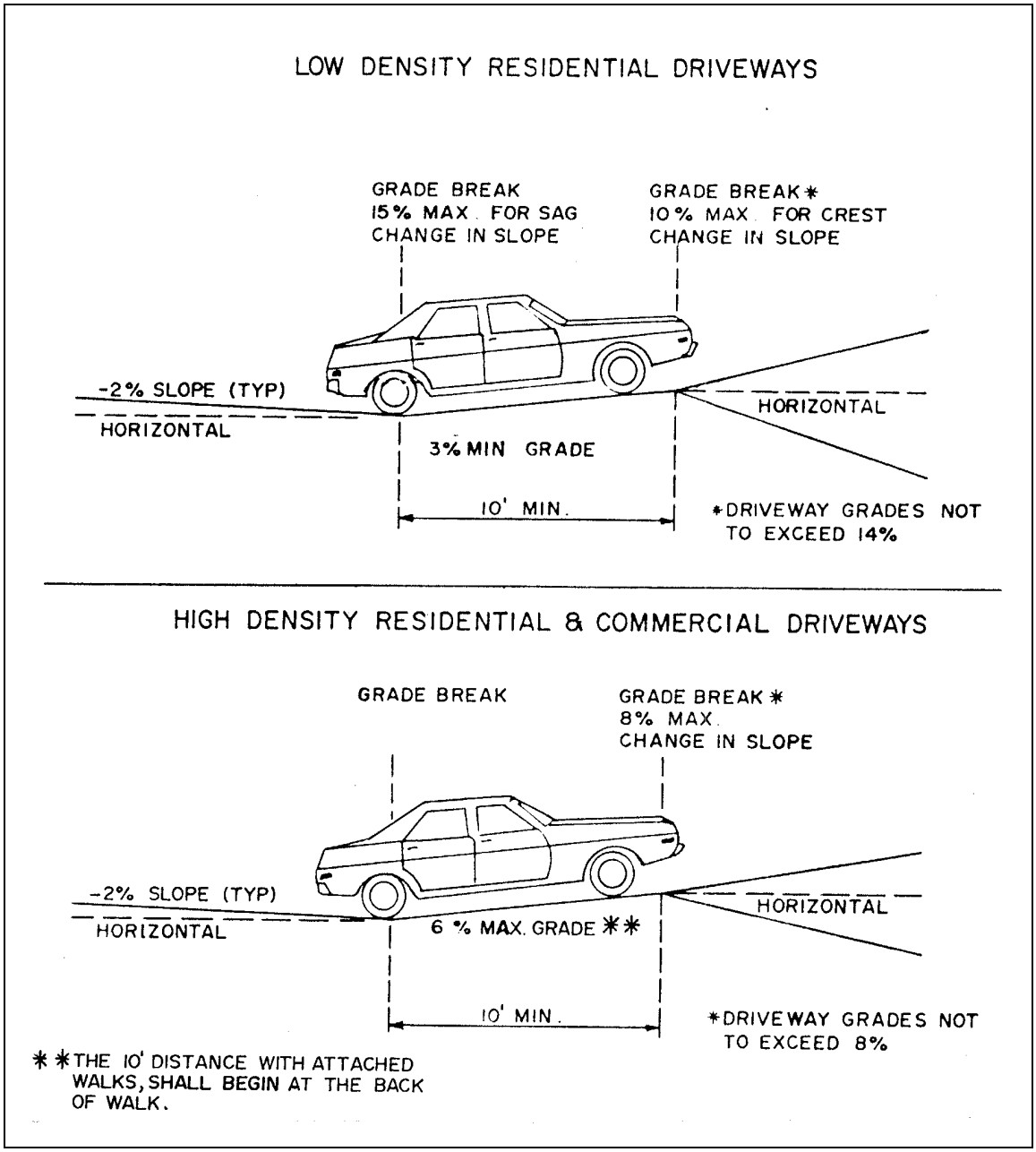


Figure 4-8
Maximum Driveway Grades

b. The driveway shall not obstruct or impair drainage in side ditches or roadside areas. Driveway culverts, where necessary, shall be adequate for surface water drainage along the roadway and shall in no case be less than the size required by the City Engineer. The distance between culverts under successive driveways shall not be less than 10 feet except as such restricted area is permitted to be

filled in under the provision of paragraph (c).

c. The restricted area between successive driveways may be filled in or graded down only when the following requirements are fully complied with:

1. The filling in or grading down shall be to grades approved by the City Engineer, and, except where drainage is by means of curb and gutter, water drainage of the area shall be directed away from the highway roadbed in a suitable manner.

2. Culvert extension under the restricted area shall be of like size and equivalent acceptable material of the driveway culvert, and intermediate manholes adequate for clean-out purposes may be required where the total culvert length exceeds 100 ft.

3. Where no side ditch separates the restricted area from the roadbed, permanent provisions may be required to separate the area from the highway roadbed, to prevent its use for driveway or parking purposes by construction of a border curb deemed adequate by the Traffic Engineer.

4.4 Vehicle Storage

When a development is located adjacent to a public street, the parking facility shall have full internal vehicular circulation and storage. Vehicular circulation shall be located completely within the property and vehicles within one portion of the development shall have access to all other portions without using the adjacent street system.

Adequate reservoir capacity shall be provided for both inbound and outbound vehicles to facilitate the safe and efficient movement between the street and the development. Inbound vehicle storage areas must be of sufficient size to ensure that vehicles will not obstruct the adjacent street, sidewalk, or circulation within the facility. Outbound vehicle storage areas must be provided to eliminate backup and delay of vehicles within the development.

The following requirements for vehicle storage in parking lots and at drive-up type facilities are based on a typical vehicle spacing of 20 feet.

4.4.1 Off-Street Parking Lots

Recommended distances from the flowline of the street to the first parking stall or aisle for a parking lot design are presented in Appendix B and were developed to provide for a storage area for outbound vehicles exiting a parking lot. Vehicle storage equivalent to the distances shown in Appendix B shall be provided at accesses serving the site. The recommended vehicle storage area needed for the entire site may be spread over several accesses if more than one access service the site. The recommended distance may be further adjusted by the City for accesses with two approach lanes and will be subject to traffic impact study findings, roadway geometry, traffic volumes, use of traffic control devices, and site layout.

4.4.2 Various Commercial Uses

Table 4-2 summarizes the vehicle storage area that must be provided for various commercial uses. These storage areas must be:

a. Based on a vehicle spacing of 12 ft. by 20 ft.

b. Separated from normal parking circulation aisles.

c. Designed using the appropriate vehicle turning template.

Type of Facility	Vehicle Storage
Drive-in Bank	6 spaces per window[1]
Drive-in Restaurant	10 spaces per window[2]
Automatic Car Wash	10 spaces per wash line
Self-service car wash	3 spaces per wash line
Drive-in Theater	15% of the total parking capacity
Hospitals[3]	1% of the total parking capacity
Service Stations	4 spaces per service position
Drive-in Liquor Store	3 spaces per window[2]

[1] Includes Savings and Loan institutions.
[2] Measured from the pick-up window.
[3] At the main entrance to the hospital.

Table 4-2
Vehicle Storage Requirements

4.5 Dumpster Location

Dumpster collection facilities shall be located such that no direct access to a public roadway for pickup maneuvering will occur.

5. GEOMETRIC DESIGN

5.1 Right-of-Way, Street and Lane Widths

The minimum required right-of-way width for a street is based on the required width of paving plus an additional width on each side of the paving to accommodate curbs, sidewalks, and utilities. The City may require additional widths for needed through lanes, turn lanes, speed change lanes, and where it is necessary to accommodate slopes and drainage structures.

Roadway Class/Lane Width	Minimum[1]	Preferred
Arterial	**10**	**12**
Collector	**10**	**12**
Local	**9**	**13**
Marginal Access Street	**9**	**11**
Rear Service Roads	**9**	**10**

[1]Lane widths less than the preferred width requires approval from the Traffic Engineer.

Table 5-1
Minimum Lane Widths

Roadway Class/Percent Grade	Maximum[1]	Preferred
Arterial	**5**	**5**
Collector	**12**	**6**
Local	**18**	**12**
Marginal Access Street	**18**	**12**
Rear Service Roads	**18**	**12**

[1]Grades greater than the preferred grade requires approval from the Traffic Engineer.

Table 5-2
Maximum Grade

5.1.1 Private Streets

The following policy describes the requirements for private streets in the City:

a. Private streets may be allowed in Residential Districts.

b. Private streets shall meet the same Engineering Standards for pavement section as a public street in an area of comparable density and traffic volume. The City prefers concrete sidewalk, curb and gutter or drainage pans on the edge of the streets. Other treatments will be reviewed for appropriateness on a case-by-case basis.

c. The width of private streets may be varied according to density and traffic impact of each site, after appropriate review by the City's Planning, Traffic Engineering, and City Engineer's staff.

d. Appropriate signs shall be permanently maintained at the entrance to the private street system that clearly indicate to the public and to the City police and street maintenance crew that the street system is private property, as required by City Council Resolution 83-550.

e. Any traffic control devices proposed for the private street systems, such as signs, signals, markings, speed control mechanisms, etc., will be subject to review and approval by the Traffic Engineer. The first 75 ft. of a private access approach to an existing or proposed signalized intersection shall be dedicated as permanent easement measured from the flowline of the public street to provide for traffic signal loop detector placement.

5.2 Roadway Shoulders

5.2.1 Outside Shoulders

On roadways where no curb is to be provided, a stabilized or paved shoulder must be provided. For local and some collectors a turf shoulder is acceptable.

Roadway Class/Shoulder Width[1]	Minimum[2]	Preferred
Arterial	**10**	**12**
Collector	**8**	**10**
Local	**6**	**8**
Mountainous (>12%)	**2**	**6**

[1] Shoulder width should be increased 2' when barrier rail is used.
[2] Shoulder width less than the preferred width requires approval from the Traffic Engineer.

Table 5-3
Outside Shoulder Width

5.2.2 Inside Shoulders

Inside shoulders on divided arterial's should be four (4) feet wide paved. Where divided arterial's have three or more through lanes in each direction a full shoulder width should be provided.

5.3 Horizontal and Vertical Alignments

5.3.1 Horizontal. Designs shall conform to the street classification scheme, which is designated in the Major Street Plan and to any future street right-of-way. Proposed streets shall be in continuous alignment with existing, planned or platted streets with which they are to connect.

Arterial, collector and local streets (if not ending in a cul-de-sac) shall extend to the boundary lines of the land to be subdivided. Proposed streets with width different from existing streets to which they are being connected shall be transitioned using pavement transition taper lengths specified in section 5.6. Excessively long straight residential streets, greater than 500 feet in length, conducive to high speed traffic, will require some form of traffic calming discussed in Section 6.7.

Minimum horizontal curve radii shall conform to the design criteria specificied in the AASHTO "A Policy on Geometric Design of Highways and Street."

Where a curved road approaches an intersection, these tangent sections must be provided on the approach to the intersection to provide for adequate sight distance of traffic control devices at the intersection.

5.3.2 Pavement Widening in Curves.

Additional pavement width may be required on horizontal curves to provide for vehicle maneuvers where no superelevation is provided or the minimum horizontal curve design criteria cannot be met. The method of calculation for the widening will be as described in the AASHTO "A Policy on Geometric Design of Highways and Street."

5.3.3 Vertical

Grades and vertical sight distance shall be subject to approval by the Traffic Engineer to ensure proper drainage and/or safety for vehicles and pedestrians. Grades of streets must not be less than 0.5%. For unsignalized intersections, the maximum allowable grade in the intersection is 6%, and

extends a minimum of 50 ft. in each direction from the outside centerline of the intersecting street. At signalized intersections, the maximum grade is 2% within the intersection and for 200 ft. in each direction. Streets shall follow the criteria listed in Table 5-4.

Design Speed	Minimum 'K' Factor[1]	
	Stopping	Passing
20	7	180
25	12	289
30	19	424
35	29	585
40	44	772
45	61	943
50	84	1203
55	114	1407
60	151	1628
65	193	1865
70	247	2197

[1] All vertical curves should be symmetrical parabolic curves. Exceptions will be reviewed on a case-by-case basis. Use of the Minimum >K= values must be approved by the Traffic Engineer.

Table 5-4
Minimum Vertical Curve Design Criteria

5.4 Superelevation on Horizontal Curves

Maximum superelevation rates for collector and arterial streets of 0.04 to 0.06 ft/ft (4% to 6%) are generally recommended for use in the City of Huntsville. Superelevation is not recommended for use on local street curves. However, crown flattening and

warping are permitted at mountainous roadway intersections, provided proper transition lengths and drainage can be obtained. All roadway designs utilizing superelevation are subject to review and approval by the City Engineer to ensure proper drainage. For design details and methodology, it is recommended that the AASHTO "A Policy on Geometric Design of Highway and Streets" be consulted.

5.5 Intersections

5.5.1 Angles

Proposed public and private streets shall intersect one another at 90 degrees angles or as close to 90 degrees as topography permits. In no case will an angle less than 70 degrees be permitted.

5.5.2 Spacing and Offsets

Arterials: Signalized intersections should normally be spaced every half mile. Nonsignalized intersections shall be "tee" intersections spaced at least 600 feet apart. If the left turn storage requirements for two "tee" intersections overlap, the minimum spacing shall be increased to provide adequate left turn storage in both directions.

Collectors: Signalized intersections should normally be spaced every half mile. Nonsignalized four legged intersections shall be spaced at least 600 feet apart. When "tee" intersections are used, the center lines of streets not in alignment shall be offset a minimum of 300 feet and be 300 feet from the nearest four legged intersection. If the left turn storage requirements for adjacent intersections overlap, the minimum spacing shall be increased to provide adequate left turn storage in both directions.

Commercial/Multifamily Local Streets: Four legged intersections should be spaced at least 600 feet apart. Where "tee" intersections are used, the center lines of streets not in alignment shall be offset a minimum of 250 feet if located along one side of a street, 125 feet if located along opposite sides of a street and be 300 ft. from the nearest four legged intersection. If the left turn storage requirements for two "tee" intersections overlap, the minimum spacing shall be increased to provide for adequate left turn storage in both directions.

Single Family Residential Local Streets: Four legged intersections should normally be spaced at least 300 feet apart. Where "tee" intersections are used, the center lines of streets not in alignment shall be offset a minimum of 250 feet if located along one side of a street and 125 feet if located along opposite sides of a street.

5.5.3 Corner Radii

At public street intersections, the property line corners and minimum flowline radii should be as shown in Table 5-5.

The vehicle used for designing intersections must be based on the following:

Residential Areas	SU30
Commercial Areas	WB50
Industrial Areas	WB60

Type of Intersection	Flowline Radius	Property Line Radius
Local - Local	**25**	**25**
Local - Collector	**25**	**25**
Collector - Collector	**30**	**30**
Local - Arterial[2]	**35**	**independently designed**
Collector - Arterial[2]	**35**	**independently designed**
Arterial - Arterial[2]	**40**	**independently designed**

[1] Additional right-of-way or easement may be required for driveways or public street intersections where islands are being used to channel traffic and control turning movements.

[2] At signalized intersections where right turn channelization islands are provided or high truck and bus volumes may use the access, a larger flowline radius may be required.

Table 5-5
Minimum Intersection Flowline Radii

5.5.4 Traffic Circles, Round-abouts, and Rotary Intersection

The City of Huntsville is amenable to the installation of rotary intersections. The use and design of each will be reviewed on a case-by-case basis.

5.6 Road Width Transition Tapers

When constructing a roadway that will directly connect with an existing roadway of a different width, it is necessary to construct a transition taper between the two. The length of taper depends upon the offset difference between the outside traveled edge of the two sections and the ratios shown in Table 5-6. These ratios are not to be used in the design of speed change or left turn storage lanes which are covered in sections 5.7 and 5.9 of this standard.

5.7 Left Turn Approach and Bay Tapers

The minimum requirements for left turn approach and bay tapers are summarized in Table 5-7.

5.8 Left Turn Lane Storage Lengths

Left turn lane storage design at both signalized and unsignalized intersections for proposed street design plans shall be determined from nomographs, Figures 5-1 and 5-2. New streets shall use the desirable lengths. Minimum design lengths shall only be permitted under constraints imposed by geometries of existing streets. Lengths of dual left turn lanes shall be based on a minimum of 60% of the single lane length required.

Design Speed	Transition Run/Offset (ft/ft)
25	**10.4/1**
30	**15/1**
35	**20.4/1**
40	**26.7/1**
45	**45/1**
50	**50/1**
55	**55/1**
60	**60/1**
65	**65/1**
70	**70/1**

Table 5-6
Minimum Road Width Transition Tapers

5.8.1 Signalized Intersections

See Figure 5-1. If no specific information is available, a signal cycle length of 100 seconds and 5 percent trucks shall be used to determine left turn storage lengths.

Design Speed	Approach[1]	Bay Taper[2]
25	125	100
30	180	140
35	245	190
40	320	250
45	540	420
50	600	470
55	660	520
60	720	570

[1] This length also applies to departure tapers.

[2] At existing closely spaced intersections, bay tapers may be shortened to provide adequate storage lengths.

Table 5-7
Minimum Left-turn Approach and Bay Tapers

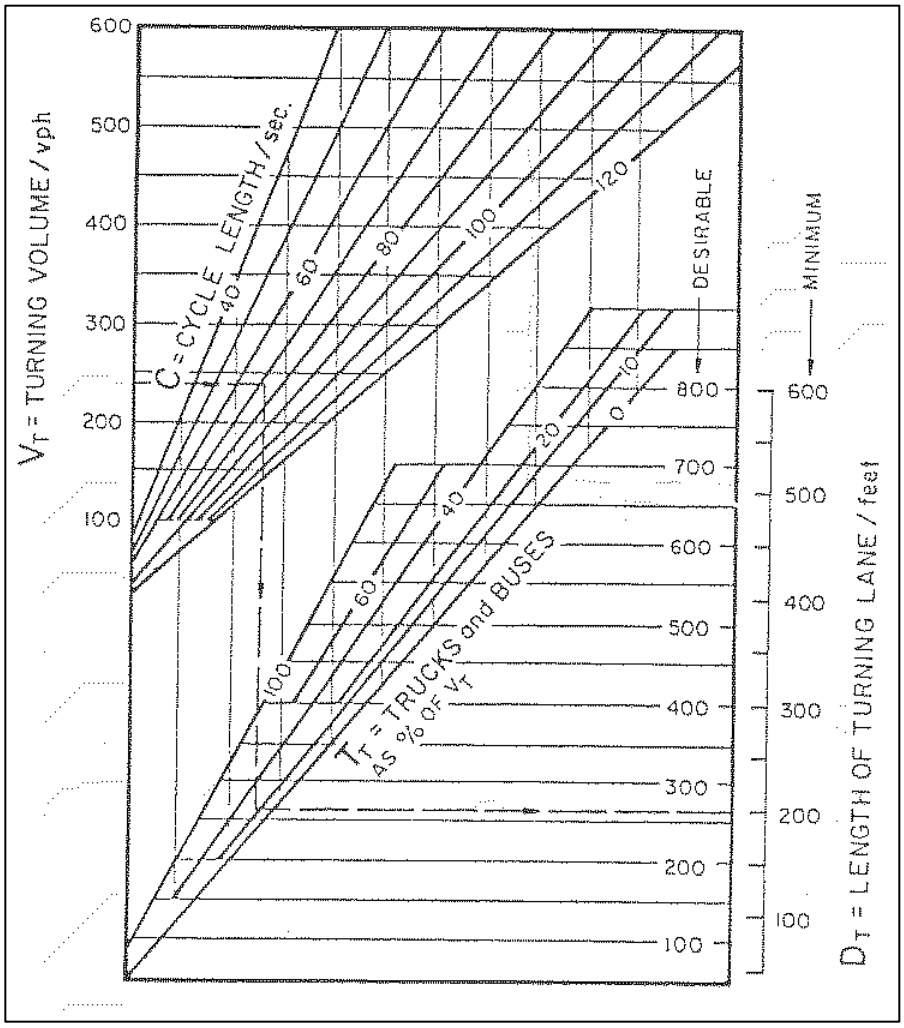


Figure 5-1
Design of Left Turn Storage Length
Signalized Intersections

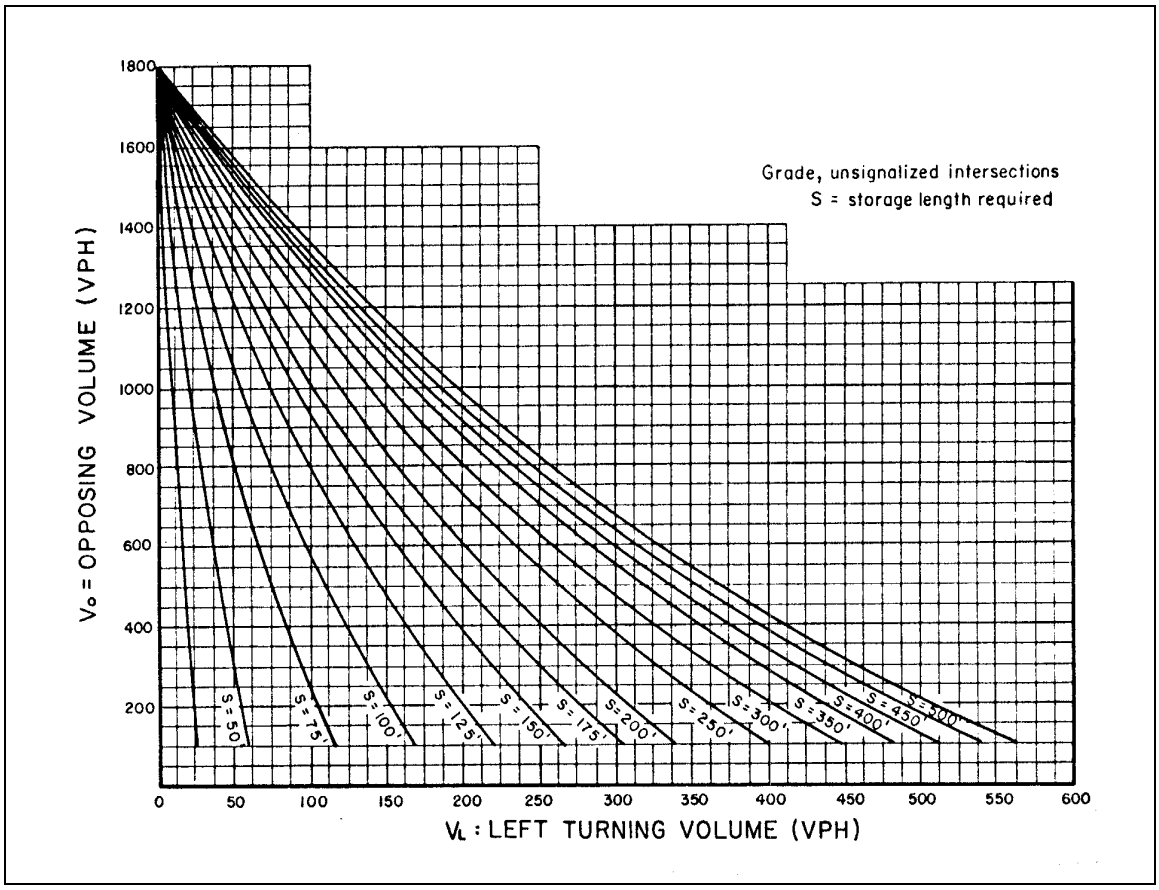


Figure 5-2
Design of Left Turn Storage Length
Unsignalized Intersections

5.8.2 Unsignalized Intersections

See Figure 5-2. Opposing volumes include only through volumes opposing the left turn movement on the same street for which the left turn channel is being designed.

On roads with one travel lane in each direction, the design length of left turn lane shall be determined by the City, but will be generally twice the requirement for a four lane highway indicated by Figure 5-2.

5.9 Speed Change Lane Design For Right and Left Turns to Accesses and Roadways

Where acceleration/deceleration lanes are extended offsite, and there is insufficient right-of-way for off-site construction, lanes shall be designed to maximize the use of available right-of-way at the time that construction plans receive final approval from the City.

When speed change lanes are required, they shall be constructed in accordance with

the following:

a. Where two accesses have speed change lanes that overlap, or are in close proximity but do not overlap, a continuous lane shall be established between the accesses to improve roadway consistency and safety and maintain edge continuity.

b. Speed change lanes shall be 12 feet wide exclusive of the gutter pan or shoulder. If existing through travel lanes are less than 12 feet wide, or if the standards contained herein permit, a lesser width may be used provided a minimum 10 ft. of widening is attained. Speed change lanes shall be a minimum of 12 ft. where the posted speed limit is above 40 mph or where a high percentage of large trucks use the lane.

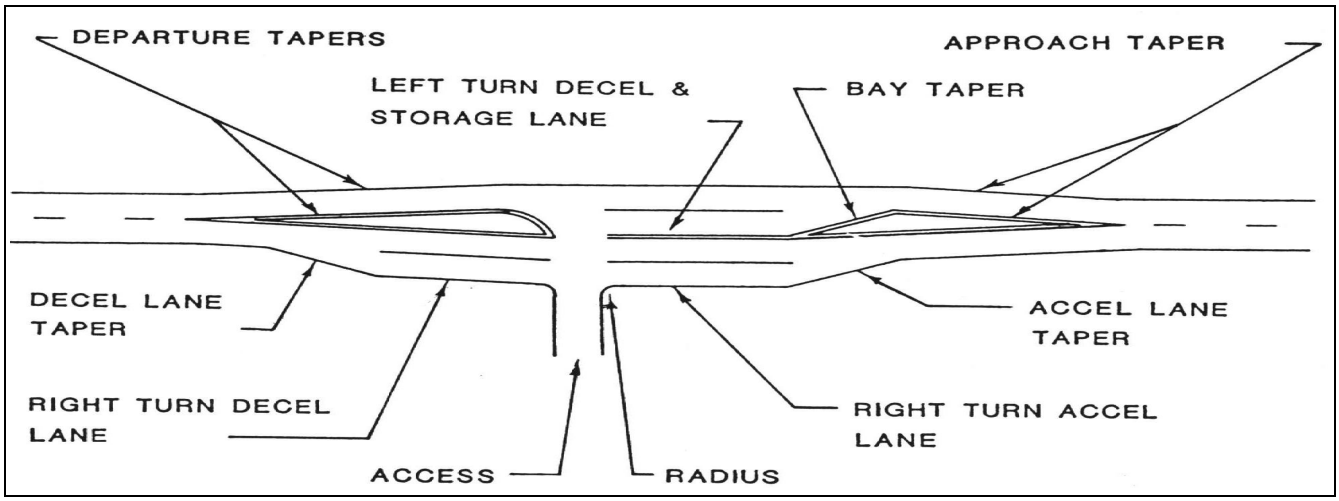


Figure 5-3
Speed Change Lane Elements

c. For a guide to speed change lane elements, see Figure 5-3.

d. Table 5-8 shall be used in determining speed change lane lengths. Taper lengths should be based on Table 5-6. "Stop Condition" means the vehicle comes to a complete stop or very slow speed prior to making the turn into the access or is in a stop mode before exiting the access.

For deceleration lanes, a 15 mph turn is normally assumed for a curb return radius only if the radius is 40 ft. or greater. A stop condition shall be assumed for a curb cut type access. For an acceleration lane, a stop condition shall be assumed at the start of the acceleration.

e. For sight distance requirements, section 5.10 of this standard shall be

complied with, unless the standards contained in section 5.10 are exceeded by the requirements of the Alabama Department of Transportation.

Design Speed or Posted Speed	Stop Condition		15 mph Turn	
	Accel	Decel	Accel	Decel
25	100	200	90	150
30	190	235	190	185
35	270	275	240	235
40	380	315	320	295
45	550	375	480	350
50	760	435	700	405
55	960	485	910	450

Table 5-8
Lane Lengths for Right and Left Turn Lanes

f. Additional storage lengths shall be required for left turn deceleration lanes where vehicle turning movements are in excess of 30 design hour vehicles to accommodate storage of left turning vehicles without shortening the deceleration lane. The additional storage lengths are provided in Table 5-9. A right turn lane shall provide for additional storage lengths when there is a stop condition as defined in (d) above and vehicle storage areas are necessary to avoid shortening of the deceleration lane.

For every 15 design hour volume trucks larger than a single unit truck, the length of the average truck plus 10 feet shall be added to the storage length required by Table 5-9.

Design Hourly Volume	Additional Storage Length (ft.)
30	25
60	50
100	100
200	175
300	250

Table 5-9
Additional Storage Length Requirements

g. The speed change lane lengths specified in Table 5-8 also require adjustments in length to account for grades. Speed change lane lengths must be modified using the multiplication factors in Tables 5-10 and 5-11 for all highways with grades in excess of 3%. The lengths in Table 5-8 excluding the additional storage lengths in Table 5-9 must be multiplied by the factors in Tables 5-10 and 5-11 to adjust for grades where necessary.

Grade	Upgrade Factor	Downgrade Factor
3 - 4.9%	0.90	1.20
5 - 8%	0.80	1.35
>8%	0.70	1.50

Table 5-10
Factors for the Effect of Grade on Deceleration Lane Lengths

Design or Posted Speed (mph)	3 - 4.9% Upgrade	3 - 4.9% Downgrade	5 - 8% Upgrade	5 - 8 % Downgrade
25-45	1.30	0.70	1.50	0.60
50	1.40	0.65	1.80	0.55
55	1.50	0.65	2.00	0.55
60	1.50	0.60	2.30	0.55

Table 5-11
Factors for the Effect of Grade on Acceleration Lane Lengths

5.10 Sight Distance

Before access to a parcel of land is approved, evidence shall be provided to ensure that vehicles can exit from the proposed access with minimum hazard and disruption of traffic.

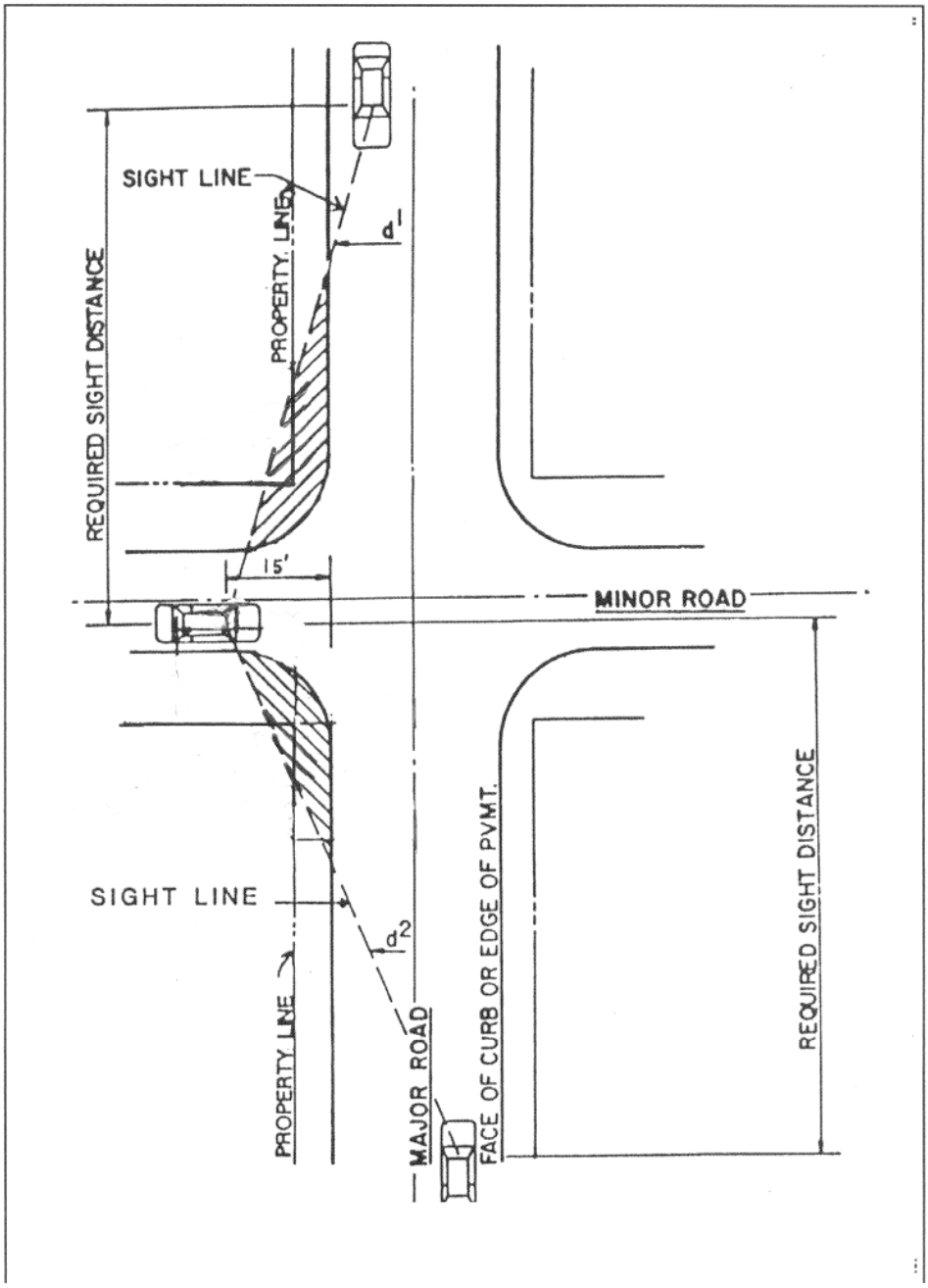


Figure 5-4
Sight Distance

5.10.1 At Public Street Intersections and Private Accesses to Public Streets:

As illustrated in 5-4, at any intersection of two streets, an unobstructed view as defined above shall be provided across the area formed by the flowline on one street and the flowline of the intersecting street and

lines (labeled d^1 or d^2 in Figure 5-4), connecting them at 15 ft. from their point of intersection. This area will be used to ensure that drivers of vehicles exiting from the stopped approach have available the minimum sight distance provided in section 5.10.2 of this standard.

Within the area of the triangle, there shall be no sight obscuring or partly obscuring wall, fence, sign, foliage, or berming higher than 30 inches above the curb grade or, in the case of trees, foliage lower than 8 ft. Vertical measurement must be made from the flowlines of the two streets forming the triangle, or if no gutter exists, from the edge of the nearest traveled way. Objects that may be located in the triangular area are items such as hydrants, utility poles, and traffic control devices. These shall be located to minimize visual obstruction.

The above also applies to intersections of public streets and railroad rights-of-way at rairoad crossings not controlled by gates or flashing lights.

5.10.2 Minimum Sight Distance

Design / Posted Speed (mph)	Safe Sight Distance ($d^{1\&2}$)
20	225
25	280
30	335
35	390
40	445
45	500
50	555
55	610
60	665

1&2 Measured from a vehicle fifteen feet back of the pavement edge.

Table 5-12

Sight Distance (ft.) for Vehicles Exiting from Private Accesses or Public Streets onto Two-Lane Roads

The distance requirements are based on 3.5 ft. driver eye height and 3.5 ft. object height for passenger cars. Where a drive serves semi-trailers, a longer sight distance will be required.

The operating speed on each approach is assumed to be, in order of desirability, a) the 85th percentile speed, b) the speed limit if based on an engineering study, or c) in the case of a new facility, the design speed.

When the criteria for sight distances cannot be met, the City will prohibit turns by exiting vehicles when appropriate or require additional speed change lane length.

Speed (mph)	Safe Sight Distance in Feet[1]		
	2 - Lane	4 - Lane	6 - Lane
30	245	290	335
35	285	340	390
40	325	390	445
45	365	435	500
50	405	480	555
55	445	525	610
60	490	580	670

[1] Measured from the point where a left-turning vehicle stops to a vehicle approaching in the outside lane.

Table 5-13

Sight Distances (ft.) for Vehicles Entering Private Accesses or Public Streets by Left Turns from a Public Street

The sight distances in Tables 5-12 through 5-15 apply when highway grades are zero to 3.0% (either up or down). When grades are steeper than 3.0%, adjustments shall be made to compensate for the different distances required to reach the speed of highway traffic. Adjustment factors are provided in Table 20.

Grade	Downgrade[1] Factor	Upgrade[2] Factor
0 - 3%	**1.0**	**1.0**
3.1 - 5%	**0.9**	**1.1**
5.1 - 8%	**0.8**	**1.2**

[1] When the highway in the section to be used for acceleration after leaving the access descends, sight distance in the direction of approaching descending highway traffic should be reduced by these factors.

[2] When the highway in the section to be used for acceleration after leaving the access ascends, the sight distance in the direction of approaching ascending traffic should be increased by these factors.

Table 5-14

Factors for the Effect of Grade on Sight Distance

5.11 Stopping Sight Distance

Stopping sight distance is the length of roadway ahead visible to the driver. The minimum stopping sight distance available on a roadway shall must be sufficiently long to enable a vehicle traveling at or near the roadway design speed to stop before reaching a stationary object in its path or react to a traffic control devices such as a stop sign.

Table 5-17 summarizes the stopping sight distance for vehicles traveling on wet pavement at zero percent grade. All roadway designs in the City should provide the minimum appropriate stopping sight distance shown in Table 5-17 for level terrain conditions, depending on the design speed of the roadway.

Design Speed (mph)	Stopping Sight Distance (ft.)[1]
20	115
25	155
30	200
35	250
40	305
45	360
50	425
55	495
60	570
65	645

[1]Assumes wet pavement conditions.

Table 5-15
Minimum Stopping Sight Distance

Design Speed	Increase for Down Grades			Assumed Speed	Decrease for Upgrades		
	Correction in Stopping Distance				Correction in Stopping Distance		
	3%	6%	8%		3%	6%	8%
20-30	10	20	30	20-28	10	10	20
31-40	20	40	70	29-36	10	20	30
41-50	30	70	110	37-44	20	30	40
51-60	50	110	170	45-52	30	50	70
61-70	60	130	200	53-55	30	60	90

Table 5-16
Effect of Grade on Stopping Sight Distance

5.12 Bikepath and Sidewalk Clearances, Widths, Grades and Routes

The Huntsville Bike Route Plan may be obtained from the Urban Development Department, Planning Division. When development occurs on a street where a bike route has been designated, the developer may be required to provide a bikepath along the property frontage if the City has determined that the bikepath is to be constructed on the side of the street that the development is taking place. If no Functional plan is available, the City will determine which side of the street a bike path is to be constructed using all information available.

Bikepaths should have a minimum width of 8 ft., a maximum grade of 8% on sustained grades and a 2% cross slope. Sidewalks must be a minimum of 4 ft. in width. Maximum detachment of a bikepath or sidewalk from the street curb must not exceed 15 ft. This is to avoid pedestrians and bicyclists leaving the alignment of the designated path as a short cut. If head-in parking is permitted adjacent to the bikepath or the bikepath is attached on arterial streets, 2 ft. of additional width will be required. Fixed objects higher than 6 inches should not be closer than 2 ft. to the edge of the bikepath/sidewalk. Objects such as signal or utility poles, signs, bus benches, fire hydrants, etc., should not be located in the sidewalk or bikepath. On arterial and collector streets, the sidewalk should normally be detached. Where it is attached, the sidewalk should be a minimum of 6 ft. in width. Special lighting treatment may be required for bikepaths provided in the middle of developments that are not adjacent to public streets.

Any time a sidewalk or bikepath on a street or in a structure having public access, is adjacent to a retaining wall having a vertical rise in excess of 25 inches, a pedestrian guardrail in conformance with City of Huntsville Engineering Standards shall be installed to protect pedestrian/bicyclists from falling off the edge of the sidewalk or bikepath.

Sidewalks and bikepaths may be required to extend off-site in order to terminate them properly so that pedestrians and bicyclists using such facilities can safely reach adjacent developments.

The criteria used by the Traffic Engineering Division for sidewalk waiver recommendation are as follows:

If the majority of the following questions are false then a sidewalk waiver may be recommended by the Traffic Engineer.

1. Is this the final subdivision along the frontage in question before development of the property will occur?

2. Is there existing development in the area that would likely have any potential usual pedestrian movement along the frontage in question?

3. Would this proposed development likely result in any usual pedestrian movement along the frontage in question?

4. Are there sidewalks connecting to the site or stubbed-out within 500 ft. of this tract along the roadway frontage in question?

5. Is the tract within 2,000 ft. of an existing or proposed school, shopping center, or convenience store? Is the tract within 2,000 ft. of an undeveloped area zoned for shopping centers, or convenience stores than if developed would result in usual pedestrian traffic along the frontage in question?

5.13 Guard Rails

Roadway hazards that may require shielding by a roadside barrier can be placed into five main categories: embankment hazards; fixed objects; nontraversable hazards; end treatments; and ditch sections.

5.13.1 Embankment Criteria:

Height and slope of embankments are the basic factors in determining barrier need for a fill section (for downward slopes). Criteria for fill sections are shown in Figure 5-5. These criteria are based on studies of the relative severity of encroachments on embankments versus impacts with roadside barriers. Embankments with slope and height combinations below the curve do not warrant protection. Obstacles on the slope may require protection and the criteria in section 5.13.2 and 5.13.3 should be used in such cases. Embankments with slope and height combinations above the curve warrant protection.

5.13.2 Fixed Object Criteria:

A clear unobstructed flat roadside is highly desirable. When these conditions cannot be met, criteria to establish barriers needed for shielding roadside objects are necessary. The removal of fixed objects should be considered as the first alternative. If it is not feasible or possible to remove or relocate a hazard, then a barrier may be necessary. A barrier should be installed only if it is clear that the barrier offers the least hazard potential.

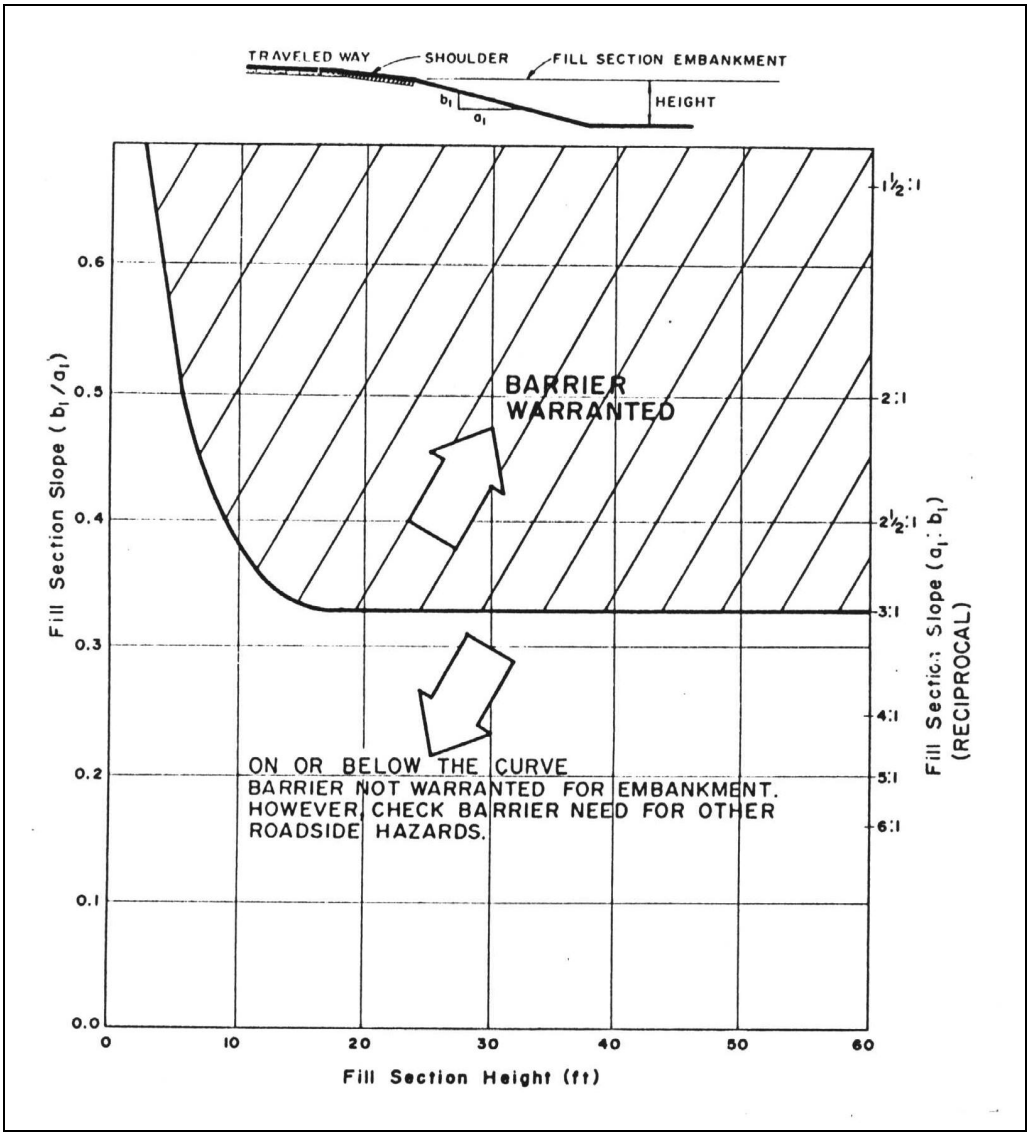


Figure 5-5
Guardrail Warrants for Embankments

Barrier criteria for fixed objects are a function of the nature of the obstacle and its distance from the edge of the traveled way. Figure 5-6 shows the criteria for determining the clear zone on fill and cut sections for three different vehicle operating speeds. The clear zone is defined as the roadside border area, starting at the edge of the traveled way, available for safe use by an errant vehicle. Fixed objects should be removed, relocated, or shielded by a barrier if they are within the indicated minimum clear zone width. The criteria of Figure 5-6 are based on two assumptions: a shoulder width of approximately 12 ft. for unrounded sections; that the object is located on the embankment or side slope.

The detailed procedures for using Figure 5-6 are provided in the AASHTO

"Roadside Design Guide." Fixed objects within the clear zone (as defined by using Figure 5-6) that warrant protection or removal are:

1. Sign and luminaire supports with either a breakaway or yielding design greater than 1,100 lb.-sec. (linear impulse) or a concrete base extending 6 in. or more above the ground.

2. Fixed sign bridge supports.

3. Bridge pier and abutments at underpasses.

4. Retaining walls and culverts.

5. Trees with diameters greater than 6 in.

6. Wood poles or posts with a cross-sectional area greater than 50 sq. in.

7. Certain styles of mailboxes.

5.13.3 Nontraversable Hazard Criteria:

Any nontraversable hazard within the clear zone (as defined by Figure 5-6) that requires shielding by a barrier should be removed. If this is not practical, a barrier should be provided. Typical nontraversable hazards are:

1. Rough rock cuts.

2. Large boulders.

3. Streams or permanent bodies of water more than 2 ft. in depth.

4. Shoulder drop-offs with slopes steeper than 1:1 and a height greater than 2 ft.

5.13.4 Bridge Rail Ends, Transitions, and End Treatment Criteria:

Most bridge rail approach barrier systems are some type of roadside barrier. For details on warrants for the protection of such roadside hazards, see the AASHTO "Roadside Design Guide."

5.13.5 Ditch Section Criteria:

Although specific criteria for barrier protection at ditches do not exist, they can be potential hazards if located near the traveled way and not traversable by an

errant vehicle. Preferable front and back slopes for various ditch configurations are provided in the AASHTO guide book.

5.13.6 Construction Details:

The Alabama Department of Transportation Standard Plans should be consulted for guardrail construction details.

Design Speed	Design ADT	FILL SLOPES			CUT SLOPES		
		6:1 or flatter	5:1 to 4:1	3:1	3:1	4:1 to 5:1	6:1 or flatter
40 MPH or less	Under 750	7-10	7-10	**	7-10	7-10	7-10
	750-1500	10-12	12-14	**	10-12	10-12	10-12
	1500-6000	12-14	14-16	**	12-14	12-14	12-14
	Over 6000	14-16	16-18	**	14-16	14-16	14-16
45-50 MPH	Under 750	10-12	12-14	**	8-10	8-10	10-12
	750-1500	12-14	16-20	**	10-12	12-14	14-16
	1500-6000	16-18	20-26	**	12-14	14-16	16-18
	Over 6000	18-20	24-28	**	14-16	18-20	20-22
55 MPH	Under 750	12-14	14-18	**	8-10	10-12	10-12
	750-1500	16-18	20-24	**	10-12	14-16	16-18
	1500-6000	20-22	24-30	**	14-16	16-18	20-22
	Over 6000	22-24	26-32*	**	16-18	20-22	22-24
60 MPH	Under 750	16-18	20-24	**	10-12	12-14	14-16
	750-1500	20-24	26-32*	**	12-14	16-18	20-22
	1500-6000	26-30	32-40*	**	14-18	18-22	24-26
	Over 6000	30-32*	36-44*	**	20-22	24-26	26-28
65-70 MPH	Under 750	18-20	20-26	**	10-12	14-16	14-16
	750-1500	24-26	28-36*	**	12-16	18-20	20-22
	1500-6000	28-32*	34-42*	**	16-20	22-24	26-28
	Over 6000	30-34*	38-46*	**	22-24	26-30	28-30

* Where a site specific investigation indicates a high probability of continuing accidents, or such occurrences are indicated by accident history, the designer may provide clear zone distances greater than 30 feet as indicated. Clear zones may be limited to 30 feet for practicality and to provide a consistent roadway template if previous experience with similar projects or designs indicates satisfactory performance.

** Since recovery is less likely on the unshielded, traversable 3:1 slopes, fixed objects should not be present in the vicinity of the toe of these slopes. Recovery of high speed vehicles that encroach beyond the edge of shoulder may be expected to occur beyond the toe of slope. Determination of the width of the recovery area at the toe of slope should take into consideration right of way availability, environmental concerns, economic factors, safety needs, and accident histories. Also, the distance between the edge of the travel lane and the beginning of the 3:1 slope should influence the recovery area provided at the toe of slope. While the application may be limited by several factors, the fill slope parameters which may enter into determining a maximum desirable recovery area are illustrated in Figure 3.2.

K_{cr} (Curve Correction Factor)

DEGREE OF CURVE	DESIGN SPEED						
	40	45	50	55	60	65	70
2.0	1.08	1.10	1.12	1.15	1.19	1.22	1.27
2.5	1.10	1.12	1.15	1.19	1.23	1.28	1.33
3.0	1.11	1.15	1.18	1.23	1.28	1.33	1.40
3.5	1.13	1.17	1.22	1.26	1.32	1.39	1.46
4.0	1.15	1.19	1.25	1.30	1.37	1.44	
4.5	1.17	1.22	1.28	1.34	1.41	1.49	
5.0	1.19	1.24	1.31	1.37	1.46		
6.0	1.23	1.29	1.36	1.45	1.54		
7.0	1.26	1.34	1.42	1.52			
8.0	1.30	1.38	1.48				
9.0	1.34	1.43	1.53				
10.0	1.37	1.47					
15.0	1.54						

Figure 5-6
Clear Zone

5.14 Medians

Raised medians may be required on arterial roadways and may be allowed on local or collector roadways. All designs are subject to review and approval by the City and subject to the standards provided by the Alabama Department of Transportation.

Median widths should be a minimum of 4 ft. flowline to flowline. If left turn lanes are installed in the median, the median should be no less than 16 ft. wide, flowline to flowline. See Table 5-19 for recommended median widths. Cuts in existing medians shall be approved by the Traffic Engineer. In new roadway designs, the minimum spacing of median openings will be kept to 600 ft., including left turn bay storage lengths and tapers. Increased storage lengths and tapers may be required as determined by the City based on available turning movement volume data or projected data from a traffic engineering study. Median openings that allow left turns in both directions must not be less than 50 ft. nose to nose. For openings that allow left turns in one direction only, see Figure 4-6.

No fixed objects will normally be permitted in medians. Plantings must be located so as not to violate the sight distance requirements provided in Tables 5-12 through 5-15 of section 5.10 of this standard.

Function	Minimum Width (ft)	Desired Width (ft)
Separation of Opposing Traffic	**4**	**10**
Pedestrian Refuge and Space for Traffic Control Devices	**6**	**14**
Left-turn Speed-change and Storage	**16**	**20**
Crossing/Entering Vehicle Storage[2]	**20**	**40**
Freeway / Expressway	**30**	**50**
U-turns, Inside-to-inside Lanes	**26**	**60**

[1] Cannot accommodate left-turn lanes which may be prohibited.

[2] This enables vehicles crossing a street with a median or turning left onto such a street to use the median area for storage so as to negotiate each half of the street separately.

Table 5-17
Minimum Median Widths

5.15 Roadway Landscaping

The "CLEAR ZONE" for plantings shall be the minimum setback distance for trees with a mature diameter at bumper height greater than 4", measured from the curb face (or edge of the traveled way for non-curbed roadways).

Clear zone distances shall be as described in the following Table 5-20, with special cases and exceptions as noted.

5.16 Vertical Clearance of Structures

A minimum vertical clearance of 17 feet should be provided for all overhead structures measured from the crown of the street to the lowest portion of the structure.

5.17 Cul-de-Sac Lengths

The maximum cul-de-sac length is 800 ft. which may be waived up to 1200 ft. by the Planning Commission, upon recommendation by the Traffic Engineer.

Design Speed (mph)	Clear Zone Width		Minimum Plantable Median Widths[2]	
	Roadway with 6" Barrier Curb	Uncurbed and Other Roadways[1]	Curbed	Noncurbed
65	N/A	35 ft.	N/A	64 ft.
60		30 ft.		64 ft.
55		12-30 ft. (22)		28-60 ft.
50		10-28 ft. (20)		24-60 ft.
45	10 ft.	10-28 ft. (18)	24 ft.	24-60 ft.
40	10 ft.	7-18'(16)	24 ft.	18-40 ft.
35	6 ft.	7-18'(14)	16 ft.	18-40 ft.
30	6 ft.	7-18'(12)	16 ft.	18-40 ft.
25	6 ft.	7-18'(7)	16 ft.	18-40 ft.

[1] For uncurbed roadways minimum setback varies according to traffic volume slope, according to Table 3.1 on page 3-4 of the AASHTO "Roadside Design Guide" (1988). Setbacks shall also conform to "shy distances," Table 5.3 on page 5-28. Further exceptions may be required or allowed by the Traffic Engineering Division in vertical and/or horizontal curves, areas where guardrails or other protective devices are used, and in other special cases. The expected 'ordinary' values are given in parentheses above.

[2] Medians: Minimum plantable width for trees > 4" mature diameter at bumper height is based on 2 x Clear Zone width, plus 4' for planting bed width, to allow for diameter growth of individual trees and lateral offset to avoid having all the median trees lined up down the median centerline. The Clear Zone width is determined by traffic volume and slope, according to Table 3.1 on page 3-4 of the AASHTO "Roadside Design Guide" (1988).

If a planting demonstrates through its accident history that it is unsafe, the Traffic Engineering Division may require its modification or removal.

Table 5-18
Minimum Plantable Median Widths

5.18 Effects of Curbs on Clear Zone

Vertical curbs, six inches and greater in height, have shown redirective capabilities

at lower speed impacts, less than or equal to 40 mph.

At higher speeds, greater than 50 mph, vertical curbs should be avoided due to the effects on errant vehicle dynamics.

Vertical curbs may be used on roadways designed at 45 to 50 mph. However, each should be reviewed based on projected roadway volumes, land uses, and potential speeds on the roadway.

Although every attempt should be made to maintain a clear zone as shown in Figure 5-6, the use of vertical curbs will permit a reduction in the clear zone on lower speed roadways. In no case will the allowable clear zone be less than six (6) feet on roadways with design speeds of 35 mph or less, or ten (10) feet on roadways with design speeds greater than 35 mph.

6. TRAFFIC SIGNALS, CONSTRUCTION ZONES, TRANSIT FACILITIES, TRAFFIC CALMING, STRIPING AND SIGNING

6.1 Traffic Control Devices General

All traffic control devices installed on public streets or public rights-of-way shall conform to the Manual of Uniform Traffic Control Devices. All materials used in the construction of these devices shall meet the State of Alabama Department of Transportation Standard Specifications for Highway Construction, The State of Alabama Department of Transportation Special and Standard Highway Drawings, and City standards. Exceptions to this requirement are permitted when and where deemed necessary by the City Traffic Engineer, may cause to have installed, by engineering judgement, signage, signals, or markings which do not conform to the standards contained in the Manual of Uniform Traffic Control Devices.

6.2 Traffic Control Device Costs and Associated Easements

For developments within the City of Huntsville, a licensed contractor shall be employed by the developer to install the traffic control devices and street name signs as required in the approved construction plans.

At proposed signalized intersections, the first 75 ft. of a private driveway approach must be dedicated as a permanent easement to the City as measured from the flowline of the cross street to provide for traffic signal loop detector placement.

Modification or relocation costs of existing traffic control devices shall be the responsibility of the developer.

6.3 Traffic Control in Construction Zones

All work area traffic control shall be in conformance with the Manual on Uniform Traffic Control Devices. All work within City rights-of-way shall have an approved traffic control plan. All traffic control plans must be approved by the City Traffic Engineer, or his duly authorized representative, prior to the commencement of work.

6.4 Striping Plans

In order to facilitate striping of new streets or restriping of existing streets necessitated by development, striping plans shall be submitted as part of the construction plans for the public improvements for approval by the City. If these plans require the addition, relocation and removal of pavement

markings, the cost of these items will be borne by the developer.

6.5 Street Name Signs

Street names must be less than twelve characters in length, including spaces, and not phonetically or grammatically similar to any street name in Madison County or the City of Huntsville.

Developers are required to provide and have installed street name signs on public and private streets in their development conforming to specifications contained in the City of Huntsville=s Traffic Engineering Specifications.

6.6 Transit Facilities

Collector and arterial roadways may sometimes serve as commuter bus routes with frequent stops which require an increased pavement design. At existing or planned bus stop locations, additional sidewalk or bikepath widths will be required for bus bench placement. The Huntsville Public Transit Division is responsible for the location of all bus stops. On State Highways, the Alabama Department of Transportation may require an increased pavement design for bus pads.

6.7 Traffic Calming

Local subdivision streets shall be laid out to reduce the likelihood of cut through traffic from Collector and Arterial roadways. Long tangent sections, which would encourage higher than posted speeds, will not be permitted.

Examples of traffic calming measures are provided in Appendix C, with those permitted in new developments noted on each detail.

For further information, the City of Huntsville, Neighborhood Traffic Management Manual should be referenced.

7. STREET LIGHTING AND UTILITIES

7.1 Warranting and Installation of Street Lighting

Warrants for street lighting on existing roadways shall be determined by using the National Cooperative Highway Research Program Report 152, Warrants for Highway Lighting.

Street lighting should be installed along all City streets. Street lighting design should be included in all collector and arterial roadway design projects. The consultant, Huntsville Utilities, or the Traffic Engineering Division may perform this design. Street lighting shall be designed to provide the proper amount of lighting for the roadway, as shown in Table 7-2. Street lighting should have adequate house side illumination to light the sidewalk to a minimum level of 0.4 foot candles (4 lux). Although many property owners prefer street lighting to provide illumination to the front door, this type of design requirement is both impractical and costly; therefore, lighting should be designed not to extend farther than the back of the sidewalk. An exception to this rule is for the Greater Downtown Area, where the City will permit the lighting of the facades of buildings, to prevent a tunnel effect. The design of street lighting shall be in conformance with the U.S. Department of Transportation, Federal Highway Administration, Roadway Lighting Handbook, Implementation Package 78-15, and addendums as published by the U.S. DOT, and the Illuminating Engineering Society=s Roadway Lighting IES RP-8 manual. Street lighting along all public rights-of-way shall be coordinated through the City of Huntsville Engineer's Office and Huntsville Utilities.

7.2 Obtrusive Light

Obtrusive light is the stray light from one property which encroaches onto another property or right-of-way. Permitted obtrusive light levels shall not exceed those listed in Table 7-1, as measured at the property line.

Zoning	Permitted Light Level	
Commercial / Industrial	**25 lux**	**2.3 fc**
Residential	**10 lux**	**0.9 fc**

Table 7-1
Permitted Obtrusive Light Levels

7.3 Breakaway Structures and Lateral Clearances

It is the intent of the Traffic Engineering Division to encourage all fixed objects installed in the right-of-way to be of the breakaway type meeting AASHTO construction specifications. Where breakaway type construction cannot be provided, it is the policy of the Traffic Engineering Division to require that the nonbreakaway object be outside the clear-zone, as defined in Section 5.13. If adequate right-of-way and/or easements are not available to provide for installation outside the clear-zone, then the Traffic Engineering Division shall require the provision of a minimum of 10 ft. horizontal clearances between the flowline of the street (or the edge of the paved traveled way), for any new or relocated nonbreakaway structure, greater than 4 inches in height. If sufficient right-of-way is not available for the 10-foot clear zone, Traffic Engineering Division requires that all installations be placed "as near as practical" to the edge of the public right-of-way. This policy is applicable to all arterial and collector roadways whose posted speed limit is greater than 30 miles per hour. For local streets, design speeds of 30 miles per hour or less, the Traffic Engineering Division recommends the provision of a 6 ft. lateral clearance. This section is

Street Type	Minimum Illumination Requirements (footcandles)	Uniformity Ratio
Freeway	**0.9**	**3 to 1**
Expressway	**1.4 (commercial) 1.0 (residential)**	**3 to 1**
Arterial	**2.0 (commercial) 1.0 (residential)**	**3 to 1**
Collector	**1.2 (commercial) 0.6 (residential)**	**4 to 1**
Local	**0.9 (commercial) 0.4 (residential)**	**6 to 1**
Greater Downtown	**1.2**	**4 to 1**

Table 7-2
Roadway Lighting Requirements

intended for new construction and/or relocation of existing utilities.

7.4 Relocation of Public Service Utilities

If construction requires the relocation, rebuilding, or upgrade of existing utilities, including traffic control devices, then the cost of such changes shall be borne by the developer.

7.5 Utility Easements

Adequate rights-of-way and/or easements shall be dedicated to allow for Huntsville Utilities and other utilities, to install the street lights, television cable, waterlines, gaslines, etc. Facilities with detached bike paths or sidewalks may use a combined traffic control, utility, and pedestrian easement for placement of the street lights between the curb and bikeway provided that the requirement for 2 ft. horizontal clearance from the bikeway is met, and the breakaway structure policy for fixed structures along roadways with posted speeds greater than 30 mph is satisfied.

Where either the bike path or sidewalk is attached, street lights must be placed behind the walk or path in an additional minimum 5 ft. utility easement. Utility easements for street lights are not exclusive, and can be landscaped or used for parking. If there is an exclusive gas easement behind an attached walk or path, the street lights must be located beyond that easement in an additional five foot easement or the gas easement relocated.

7.6 Under grounding of New and Existing Utilities

It is the policy of the City to require the use and facilitate the installation of underground utilities for initial installation of utilities and for the replacement and relocation of existing utilities. It is the policy of the City to promote a reduction in the number of utility poles during the replacement, relocation, upgrade, and maintenance of existing overhead utilities.

8. PARKING

8.1 Regular Parking

8.1.1 Space Requirements: The minimum off-street parking spaces required for permitted and special uses are provided in Article 70 of the City's Zoning Ordinance.

8.1.2 Ratio Variances: The Traffic Engineering Division will not support requests for parking ratio variances to the Board of Adjustments until relevant parking data has been submitted for review justifying the applicant's position.

8.1.3 Stall Estimates: To estimate the number of parking stalls that could be provided on a vacant piece of ground, 350 square feet per stall should be used for estimation purposes. Where a significant amount of compact parking is to be included, a 325 square foot ratio should be used.

8.1.4 Stall Layout: Conventional parking layout dimensions are provided in Figure 8-1. Other angled parking layouts meeting the approval of the City will be permitted where possible.

8.1.5 Back-out Parking: Parking shall not be permitted that requires vehicles to back directly onto or off of a public roadway. The only exception is for residential developments on local streets.

8.2 Maximum Allowable Grades Permitted in Parking Lots.

Maximum grades permitted in parking lots shall not exceed 8%.

8.3 Shared Parking

Planning applications where reciprocal or shared parking is contemplated may be required to include parking accumulation studies for existing facilities similar to the proposed uses and for the surrounding uses with which parking is being reciprocated. The following guidelines should be followed:

a. Determine if shared parking is possible by examining the land use mix adjacent to the subject site, the size of each use, the type of operation, and most important, the 12 to 24-hour parking demand characteristics of each use.

b. Conduct 12 to 24-hour parking accumulation studies for existing facilities similar

to those for which reciprocal parking is being requested, and for the surrounding ones with which shared parking is anticipated. Weekly and monthly variations in parking demand must be taken into consideration.

c. Occupancy factors may be a consideration in determining how well the parking spaces for the existing adjacent uses, with which shared parking is being contemplated, are currently being utilized. These can be determined during the accumulation studies outlined above.

d. Based on the data for existing similar facilities, the total parking demand for all uses included in the shared parking analysis shall be projected for each hour over a 12 to 14-hour period for the most critical day of the week and month of the year. This shall include the Thanksgiving to Christmas period. This will determine the minimum number of spaces that shall be provided.

e. Based on this analysis, if the maximum number of vehicles accumulated during a 24-hour period for all uses exceeds the number of spaces that are required to be provided by city ordinances for all the uses, no reciprocal or shared parking will be permitted.

f. If the projected peak accumulated demand is lower than the spaces required to be provided by ordinance, elimination of those spaces exceeding the maximum accumulated demand may be considered by permitting shared parking, providing details of an agreement are provided to the City guaranteeing perpetuity of such shared parking arrangements in case of future ownership or tenant changes.

8.4 Parking Generation

Although, the City=s Zoning Ordinance, Article 70, provides for minimum off-street parking space requirements, increasing the number of spaces required to handle certain development types may be necessary. Parking generation requirements may be obtained from ITE=s Parking Generation Manual.

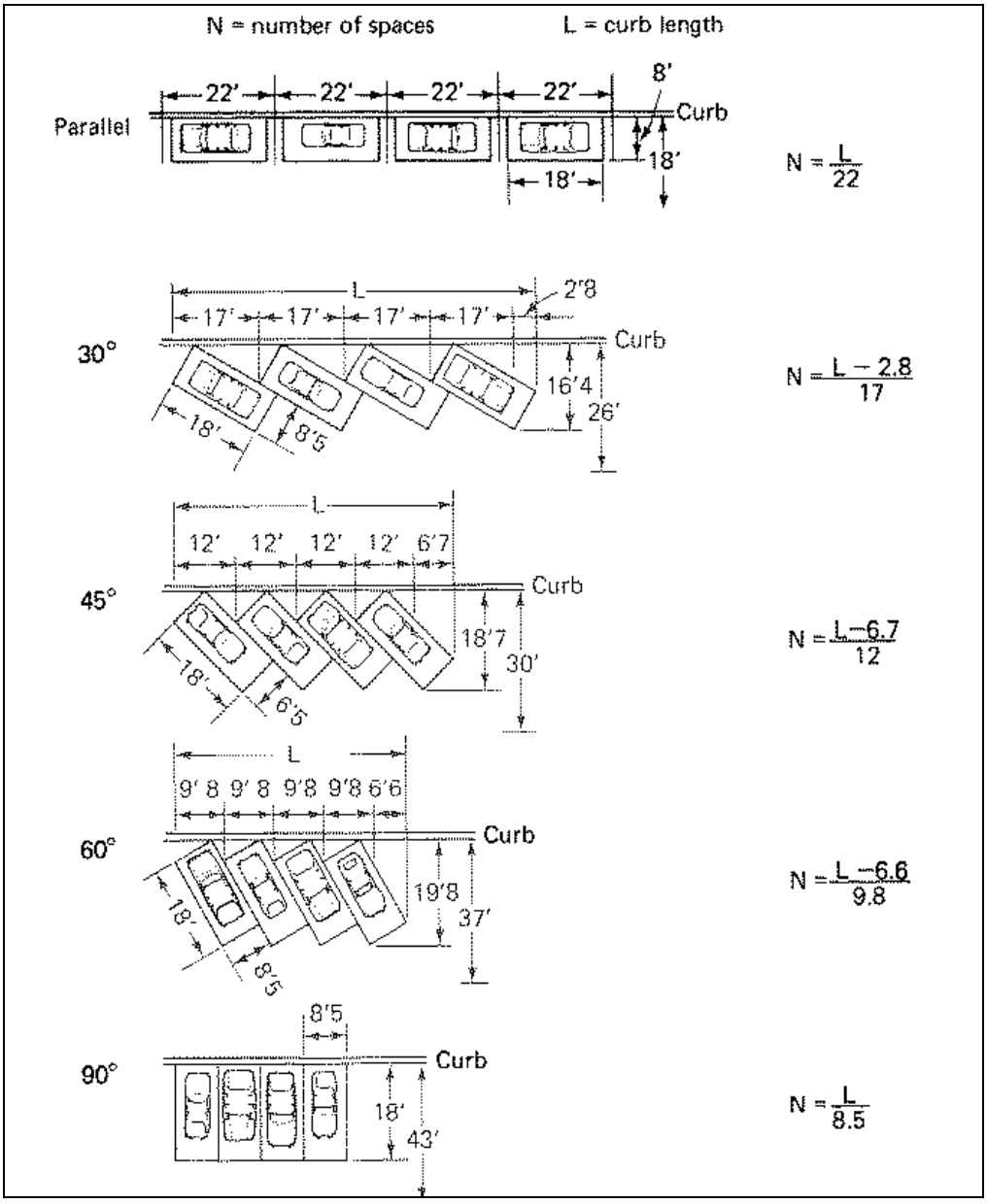


Figure 8-1
Approximate Number of Spaces
Based on Curb Line Length

ANGLE OF PARKING	STALL WIDTH	CURB LENGTH PER CAR	STALL DEPTH	DRIVEWAY WIDTH OR AISLES
	A	C	D	E
0°	8'0" 8'6" 9'0" 9'6" 10'0"	23'0" 23'0" 23'0" 23'0" 23'0"	8'0" 8'6" 9'0" 9'6" 10'0"	12'0" 12'0" 12'0" 12'0" 12'0"
20°	8'0" 8'6" 9'0" 9'6" 10'0"	23'5" 24'11" 26'4" 27'10" 29'3"	14'0" 14'6" 15'0" 15'6" 15'11"	11'0" 11'0" 11'0" 11'0" 11'0"
30°	8'0" 8'6" 9'0" 9'6" 10'0"	16'0" 17'0" 18'0" 19'0" 20'0"	16'6" 16'11" 17'4" 17'10" 18'3"	11'0" 11'0" 11'0" 11'0" 11'0"
40°	8'0" 8'6" 9'0" 9'6" 10'0"	12'5" 13'3" 14'0" 14'10" 15'8"	18'4" 18'9" 19'2" 19'6" 19'11"	13'0" 12'0" 12'0" 12'0" 12'0"
45°	8'0" 8'6" 9'0" 9'6" 10'0"	11'4" 12'0" 12'9" 13'5" 14'2"	19'2" 19'5" 19'10" 20'2" 20'6"	14'0" 13'6" 13'0" 13'0" 13'0"
50°	8'0" 8'6" 9'0" 9'6" 10'0"	10'6" 11'2" 11'9" 12'5" 13'2"	19'9" 20'0" 20'5" 20'9" 21'0"	14'0" 12'6" 12'0" 12'0" 12'0"
60°	8'0" 8'6" 9'0" 9'6" 10'0"	9'3" 9'10" 10'5" 11'0" 11'6"	20'5" 20'9" 21'0" 21'3" 21'6"	19'0" 18'6" 18'0" 18'0" 18'0"
70°	8'0" 8'6" 9'0" 9'6" 10'0"	8'6" 9'0" 9'8" 10'2" 10'8"	20'8" 20'10" 21'0" 21'3" 21'3"	20'9" 19'6" 19'0" 18'6" 18'0"
80°	8'0" 8'6" 9'0" 9'6" 10'0"	8'2" 8'8" 9'2" 9'8" 10'3	20'2" 20'3" 20'4" 20'5" 20'6"	25'0" 24'0" 24'0" 24'0" 24'0"
90°	8'0" 8'6" 9'0" 9'6" 10'0"	8'0" 8'6" 9'0" 9'6" 10'0"	18'0" 18'0" 18'0" 18'0" 18'0"	26'0" 25'0" 24'0" 24'0" 24'0"
90° Back In	8'0" 8'6" 9'0"	8'0" 8'6" 9'0"	18'6" 18'6" 18'6"	22'0" 21'0" 20'0"

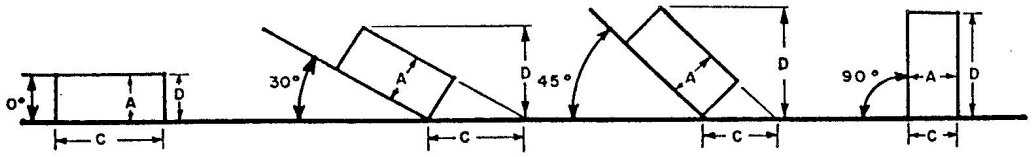


Figure 8-2
Parking Lot Dimensions

APPENDIX A

LAND USES GENERATING 100 OR MORE TRIPS DURING THE PEAK HOUR

All Suites Hotel	100 or more	Rooms
Amusement Park	5 or more	Acres
Apartment	145 or more	Dwelling Units
Apparel Store	26,000 or more	Square Feet Floor Area
Arena	30 or more	Acres
Automobile Care Center	30,000 or more	Square Feet Floor Area
Bowling Alley	28 or more	Bowling Lanes
Building Materials and Lumber Store	17,000 or more	Square Feet Floor Area
Building Materials and Lumber Store	4.5 or more	Acres
Business Park	34,000 or more	Square Feet Floor Area
Business Park	3 or more	Acres
Business Hotel	200 or more	Rooms
Campground/Recreational Vehicle Park	No data available	
Cemetery	250 or more	Acres
Church	70,000 or more	Square Feet Floor Area
City Park	160 or more	Acres
City Park	130 or more	Picnic Sites
Clinic	75 or more	Employees
Clinic	25 or more	Full-time Doctors
Commercial Airport	12 or more	Flights per day
Commercial Airport	80 or more	Employees
Congregate Care Facility	600 or more	Dwelling Units
Convenience Market (24 Hours)	1,500 or more	Square Feet Floor Area
Convenience Market w/ Gasoline Pumps	2 or more	Pumps
Convenience Market (15-16 Hours)	2,800 or more	Square Feet Floor Area
Convenience Market w/ Gasoline Pumps	1,400 or more	Square Feet Floor Area
Corporate Headquarters Building	230 or more	Employees
Corporate Headquarters Building	70,000 or more	Square Feet Floor Area
County Park	30 or more	Acres
County Park	80 or more	Picnic Sites
Day Care Center	120 or more	Students
Day Care Center	6000 or more	Square Feet Floor Area
Discount Store	15,000 or more	Square Feet Floor Area
Discount Supermarket	10,000 or more	Square Feet Floor Area
Discount Club	10,000 or more	Square Feet Floor Area
Dog Race Track	No data available	
Drinking Place	6,500 or more	Square Feet Floor Area
Drive-In Bank	1,500 or more	Square Feet Floor Area
Drive-In Savings and Loan	10,000 or more	Square Feet Floor Area

Drive-In Bank	2 or more	Drive-In Windows
Drive-In Savings and Loan	2 or more	Drive-In Windows
Elderly Housing - Detached	225 or more	Dwelling Units
Elderly Housing - Attached	1600 or more	Dwelling Units
Elementary School	350 or more	Students
Elementary School	35,000 or more	Square Feet Floor Area
Factory Outlet Center	34,000 or more	Square Feet Floor Area
Fast Food Restaurant w/o Drive-Through	800 or more	Square Feet Floor Area
Fast Food Restaurant w/o Drive-Through	20 or more	Seats
Fast Food Restaurant w/ Drive-Through	40 or more	Seats
Fast Food Restaurant w/ Drive-Through	1,500 or more	Square Feet Floor Area
Furniture Store	20,000 or more	Square Feet Floor Area
General Aviation Airport	300 or more	Flights per day
General Office Building	100 or more	Employees
General Office Building	30,000 or more	Square Feet Floor Area
General Aviation Airport	235 or more	Based Aircraft
General Light Industrial	90,000 or more	Square Feet Floor Area
General Light Industrial	11 or more	Acres
General Heavy Industrial	250 or more	Employees
General Heavy Industrial	140,000 or more	Square Feet Floor Area
General Heavy Industrial	24 or more	Acres
General Aviation Airport	50 or more	Employees
General Light Industrial	200 or more	Employees
Golf Course	150 or more	Acres
Golf Course	21 or more	Holes
Government Office Building	9,000 or more	Square Feet Floor Area
Government Office Building	50 or more	Employees
Hardware/Paint Store	9,000 or more	Square Feet Floor Area
Health Club	24,000 or more	Square Feet Floor Area
High Turnover (Sit-Down) Restaurant	80 or more	Seats
High School	50 or more	Students
High School	45 or more	Employees
High Turnover (Sit-Down) Restaurant	3,000 or more	Square Feet Floor Area
High-cube warehouse	150 or more	Employees
High-Rise Residential Condominium	260 or more	Dwelling Units
High-Rise Apartment (> 10 floors)	250 or more	Dwelling Units
Horse Race Track	20 or more	Acres
Hospital	75 or more	Beds
Hospital	57,000 or more	Square Feet Floor Area
Hospital	180 or more	Employees
Hotel	150 or more	Rooms
Industrial Park	100,000 or more	Square Feet Floor Area
Industrial Park	11 or more	Acres
Industrial Park	230 or more	Employees
Junior/Community College	45,000 or more	Square Feet Floor Area
Junior/Community College	625 or more	Students
Library	16,000 or more	Square Feet Floor Area
Live Theater	No data available	
Lodge/Fraternal Organization	2500 or more	Members

Low-Rise Residential Condominium	150 or more	Dwelling Units
Low-Rise Apartment (< 3 floors)	160 or more	Dwelling Units
Luxury Residential Condominium	140 or more	Dwelling Units
Manufacturing	11 or more	Acres
Manufacturing	120,000 or more	Square Feet Floor Area
Manufacturing	250 or more	Employees
Marina	450 or more	Berths
Marina	30 or more	Acres
Medical-Dental Office Building	12,000 or more	Square Feet Floor Area
Medical-Dental Office Building	90 or more	Employees
Mid-Rise Apartments (2 < floors < 10)	225 or more	Dwelling Units
Military Base	260 or more	Employees
Mini-warehouse	3000 or more	Storage Units
Mini-warehouse	14 or more	Employees
Mini-warehouse	350,000 or more	Square Feet Floor Area
Mini-warehouse	22 or more	Acres
Mobile Home Park	22 or more	Acres
Mobile Home Park	170 or more	Dwelling Units
Motel	150 or more	Rooms
Movie Theater Without Matinee	300 or more	Seats
Movie Theater Without Matinee	3 or more	Movie Screens
Movie Theater With Matinee	6 or more	Movie Screens
Movie Theater With Matinee	340 or more	Seats
Movie Theater With Matinee	25,000 or more	Square Feet Floor Area
New Car Sales	34,000 or more	Square Feet Floor Area
Nursery (Wholesale)	17,000 or more	Square Feet Floor Area
Nursery (Garden Center)	9,000 or more	Square Feet Floor Area
Nursery (Wholesale)	170 or more	Acres
Nursing Home	250 or more	Beds
Nursery (Garden Center)	5 or more	Acres
Office Park	3.4 or more	Acres
Office Park	55,000 or more	Square Feet Floor Area
Prison	140 or more	Employees
Private School (K-12)	100 or more	Students
Private School (K-12)	20 or more	Employees
Quality Restaurant	185 or more	Seats
Quality Restaurant	9,000 or more	Square Feet Floor Area
Racquet Club	20 or more	Courts
Recreational Homes (Resort)	230 or more	Acres
Recreational Community Center	65,000 or more	Square Feet Floor Area
Recreational Homes (Resort)	140 or more	Dwelling Units
Regional Park	80 or more	Acres
Research and Development Center	90,000 or more	Square Feet Floor Area
Research and Development Center	4.5 or more	Acres
Residential Planned Unit Development	24 or more	Acres
Residential Planned Unit Development	140 or more	Dwelling Units
Residential Condominium/Townhouse	185 or more	Dwelling Units
Resort Hotel	170 or more	Rooms
Retirement Community	300 or more	Dwelling Units

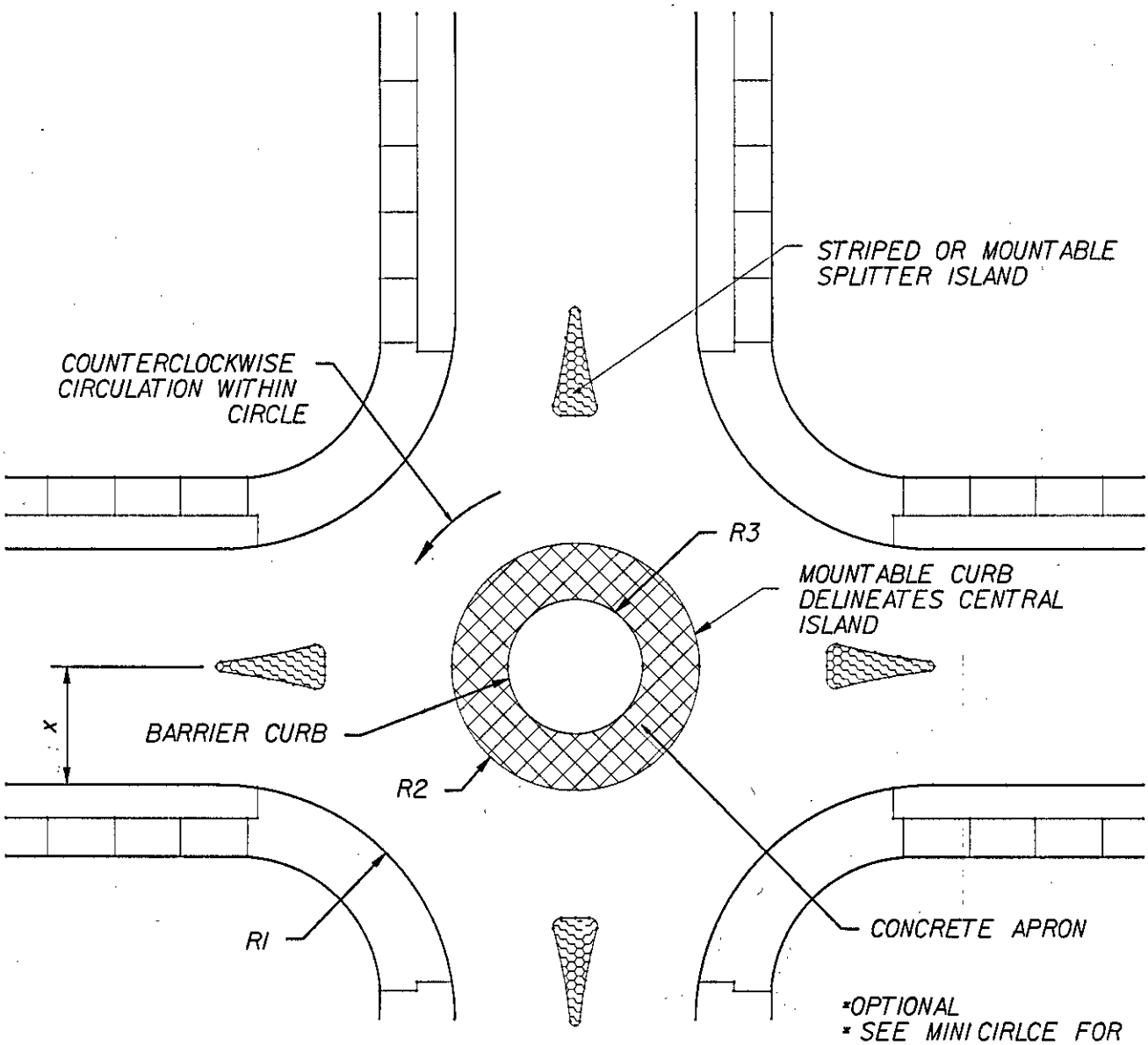
Self Service Car Wash	12 or more	Wash Stalls
Service Station w/ Convience Market	14 or more	Hoses
Service Station w/ Convience Market	6 or more	Pumps
Service Station	6 or more	Pumps
Service Station w/ Convience Market	1,200 or more	Square Feet Floor Area
Service St. w/ Conv. Market/Car Wash	5 or more	Pumps
Shopping Center	10,000 or more	Square Feet Floor Area
Single Tenant Office Building	200 or more	Employees
Single Tenant Office Building	60,000 or more	Square Feet Floor Area
Single-Family Detached Housing	35 or more	Acres
Single-Family Detached Housing	100 or more	Dwelling Units
Specialty Retail Center	4,900 or more	Square Feet Floor Area
State Park	3000 or more	Acres
State Park	100 or more	Picnic Sites
Supermarket	5,300 or more	Square Feet Floor Area
Synagogue	20,000 or more	Square Feet Floor Area
Tennis Courts	20 or more	Courts
Tire Store	22 or more	Service Bays
Tire Store	17,000 or more	Square Feet Floor Area
Truck Terminal	13 or more	Acres
Truck Terminal	160 or more	Employees
U. S. Post Office	10,000 or more	Square Feet Floor Area
University/College	400 or more	Students
Walk-In Bank	2,500 or more	Square Feet Floor Area
Walk-In Savings and Loan	5,000 or more	Square Feet Floor Area
Warehousing	11 or more	Acres
Warehousing	165,000 or more	Square Feet Floor Area
Warehousing	170 or more	Employees
Water Slide Park	60 or more	Parking Spaces
Zoo	8.5 or more	Acres

APPENDIX B

ON SITE VEHICLE STORAGE
FOR PARKING LOT ACCESS

LAND USE	SIZE	LOCAL (FT)	COLLECTOR (FT)	ARTERIAL (FT)
Low Rise Apts.	0 - 80 units	20	40	40
	81 - 160	40	40	40
	161 - 300	40	40	80
High Rise Apts.	0 - 300 units	20	40	80
Condominiums	0 - 60 units	20	40	40
Mobile Homes	61 - 120	20	40	40
Planned Unit	121 - 180	40	40	60
Development	181 - 240	40	40	80
	241 - 300	40	60	100
Quality Restaurant	0 - 15000 sq ft	20	20	20
	15000 - 30000	20	20	40
High Turnover / Sit	0 - 8000 sq ft	20	20	20
Down Restaurant	8001 - 16000	20	20	40
	16000 - 20000	20	40	60
Drive-In Restaurant	0 - 2000 sq ft	20	20	20
	2001 - 3000	20	40	80
	3001 - 5000	40	60	120
	5001 - 7000	60	80	180
Motel / Hotel	0 - 150 rooms	20	20	40
	151 - 400	20	60	100
	401 - 700	20	100	140
Convention Hotel	0 - 150 rooms	40	60	80
	151 - 400	60	120	200
	401 - 700	80	200	280
Office Park	0 - 20000 sq ft	20	20	20
	20001 - 50000	20	40	60
	50001 - 100000	20	60	140
	100001 - 150000	60	100	200
	150001 - 300000	100	200	400
	300001 - 500000	160	320	660
Industrial Park	0 - 500000 sq ft	80	120	200

LAND USE	SIZE	LOCAL (FT)	COLLECTOR (FT)	ARTERIAL (FT)
General Office	0 -50000 sq ft	20	20	40
	50001 - 100000	40	60	80
	100001 - 150000	40	80	140
	150001 - 200000	60	100	180
	200001 - 300000	80	140	280
	300001 - 400000	100	180	360
	400001 - 500000	120	220	460
Medical Clinic	0 - 100 employees	20	20	40
Supermarket	0 - 20000 sq ft	20	20	40
	20001 - 30000	20	40	60
	30001 - 40000	40	60	80
	40001 - 50000	60	80	120
Drive-In Bank	0 - 10000 sq ft	20	20	40
	10001 - 20000	40	80	160
	20001 - 30000	60	120	240
	30001 - 40000	80	160	320
	40001 - 50000	120	200	400
Shopping Center/	0 - 10000 sq ft	20	40	60
Discount Store	10001 - 20000	20	40	100
	20001 - 30000	40	80	140
	30001 - 40000	60	100	180
	40001 - 50000	60	120	200
	50001 - 100000	60	120	200
	100001 - 150000	80	140	300
	150001 - 200000	100	200	300
	200001 - 250000	120	240	500
	250001 - 300000	140	300	600
	300001 - 400000	140	300	600
	400001 - 500000	140	300	600
	500001 - 600000	140	300	600
	600001 - 700000	160	300	600
	700001 - 800000	180	340	700
	800001 - 900000	200	400	780
	900001 - 1000000	220	440	860
	1000001 - 1500000	260	480	900
Light Industrial	0 - 100000 sq ft	20	60	80
	100001 - 200000	60	80	100
	200001 - 300000	80	100	120
	300001 - 400000	80	120	140
	400001 - 500000	100	140	200



*OPTIONAL
* SEE MINI CIRLCE FOR CURB DETAIL

X	R1	R2	R3
16'	15'	23'	7'
	20'	18'	7'
	25'	20'	7'
14'	15'	10'	5'
	20'	11'	5'
	25'	12'	5'
12'	15'	6'	3'
	20'	8'	3'
	25'	9'	3'

NEW DEVELOPMENT	EXISTING DEVELOPMENT
X	X

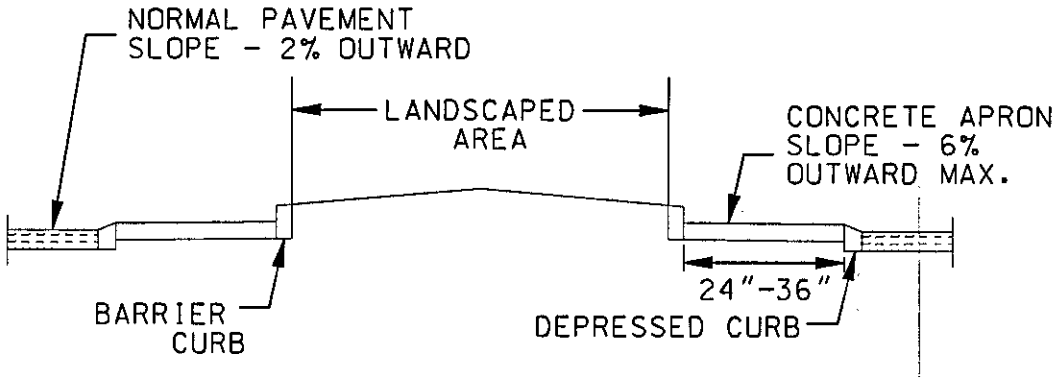
N.T.S.

REVISIONS		
DESCRIPTION	NAME	DATE

CITY OF HUNTSVILLE

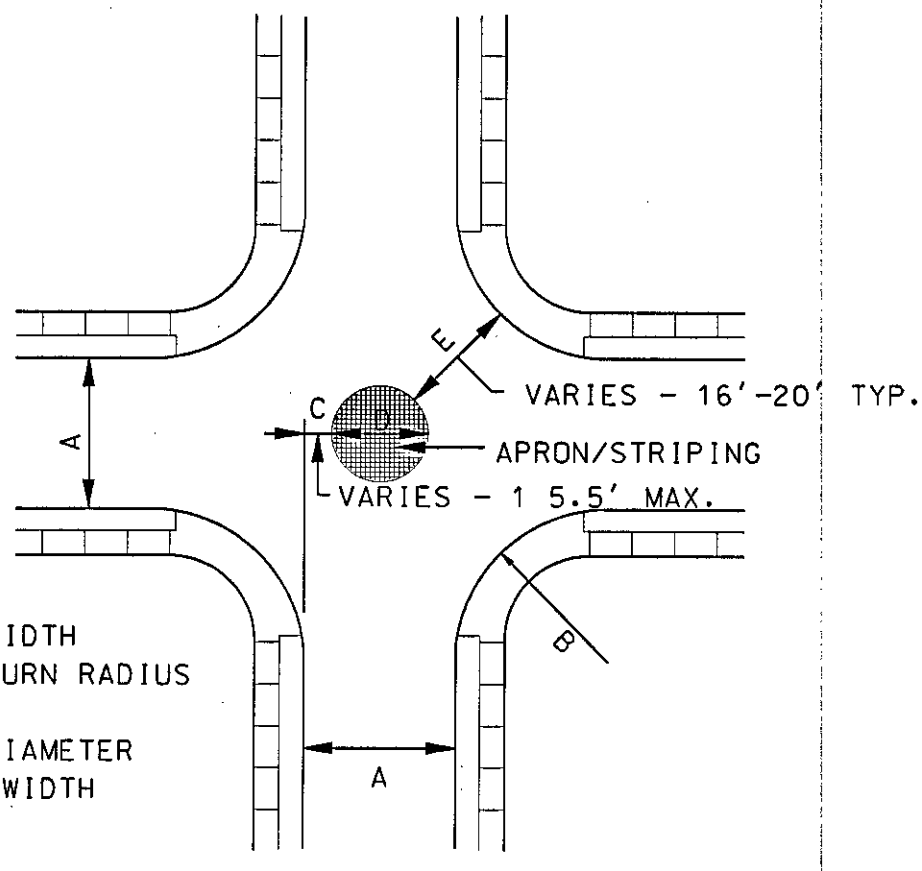
TRAFFIC CIRCLE

DIRECTOR	DATE	ENGINEER OF PUBLIC WORKS CITY OF HUNTSVILLE, ALABAMA	TD-0



ISLAND SECTION

N.T.S.



LEGEND

A STREET WIDTH
B CURB RETURN RADIUS
C OFF-SET
D CIRCLE DIAMETER
E OPENING WIDTH

NEW DEVELOPMENT	EXISTING DEVELOPMENT
X	X

PLAN VIEW

N.T.S.

REVISIONS		
DESCRIPTION	NAME	DATE
DIRECTOR		DATE

CITY OF HUNTSVILLE

ALTERNATIVE DESIGN FOR
A MINI TRAFFIC CIRCLE

ENGINEER OF PUBLIC WORKS
CITY OF HUNTSVILLE, ALABAMA

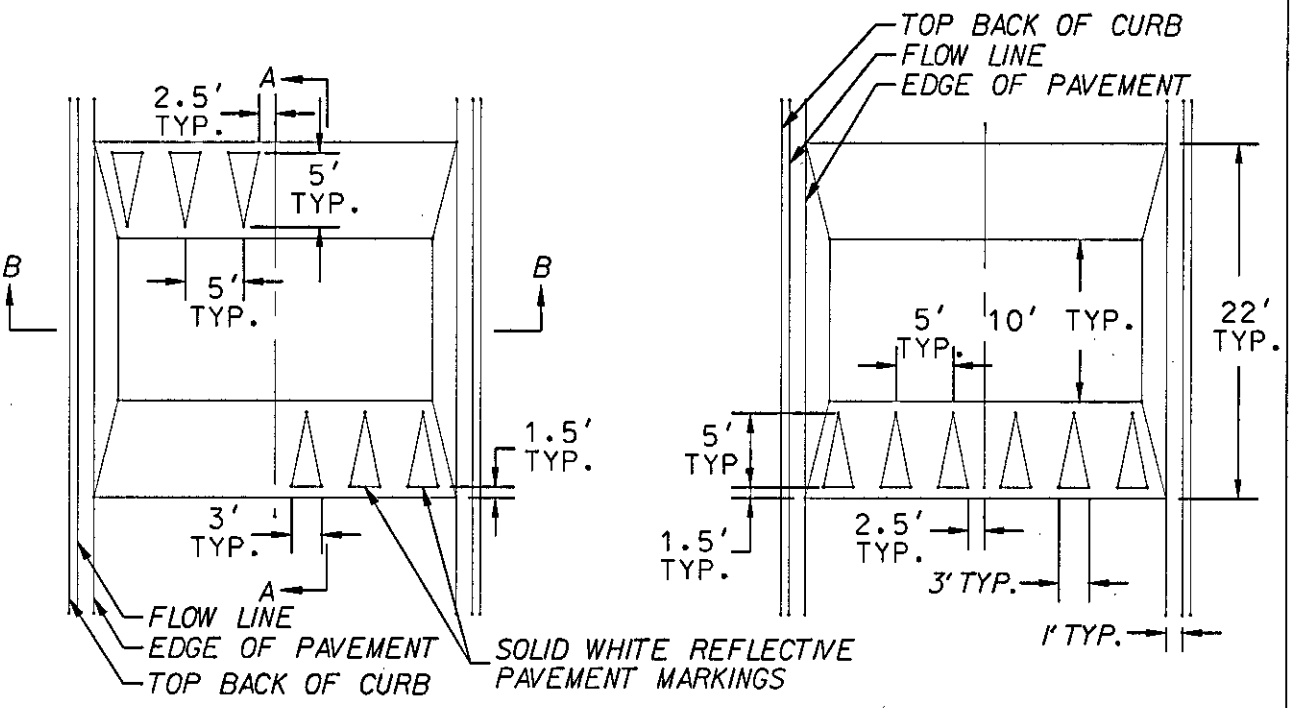
TD-1

"A" STREET WIDTH (FEET)	"B" CURB RADIUS (FEET)	"C" OFFSET DISTANCE (FEET)	"D" CIRCLE DIAMETER (FEET)	"E" OPENING WIDTH (FEET)
22	<14	RECONSTRUCT CURBS		
	15	5.5	11	16
	20	4.5	13	18
	25	4.0	15	19
24	<12	RECONSTRUCT CURBS		
	15	5.0	14	17
	20	4.5	15	18
	25	3.5	17	20
30	10	5.5	19	16
	15	5.0	20	17
	20	4.0	22	19
	25	3.0	24	20
32	10	5.5	21	16
	15	4.5	23	18
	20	4.0	24	19
	25	2.5	27	20

THE OPTIMAL RELATIONSHIP BETWEEN OFFSET DISTANCE AND OPENING WIDTH IS:

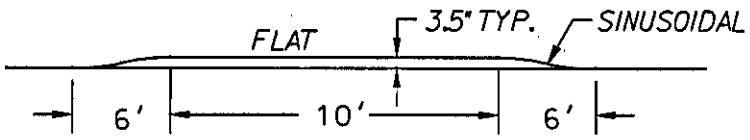
5.5 FEET MAX	16 FEET MIN.
5	17
4.5	18
4	19
3.5 OR LESS	20

REVISIONS			CITY OF HUNTSVILLE	
DESCRIPTION	NAME	DATE	CENTER ISLAND DIMENSIONS FOR MINI TRAFFIC CIRCLE	
DIRECTOR		DATE	ENGINEER OF PUBLIC WORKS CITY OF HUNTSVILLE, ALABAMA	TD-2

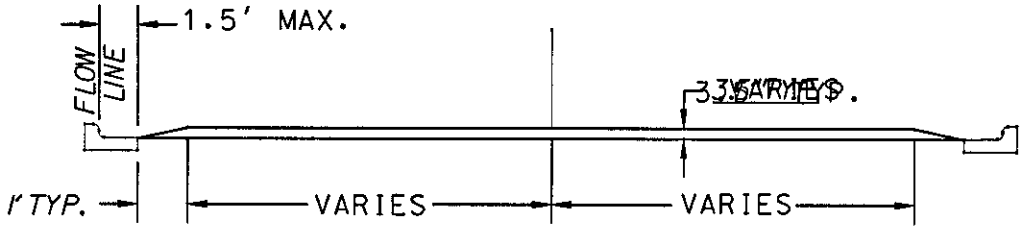


TWO-WAY STREET

ONE-WAY STREET



SECTION A-A



SECTION B-B

NEW DEVELOPMENT	EXISTING DEVELOPMENT
	X

N.T.S.

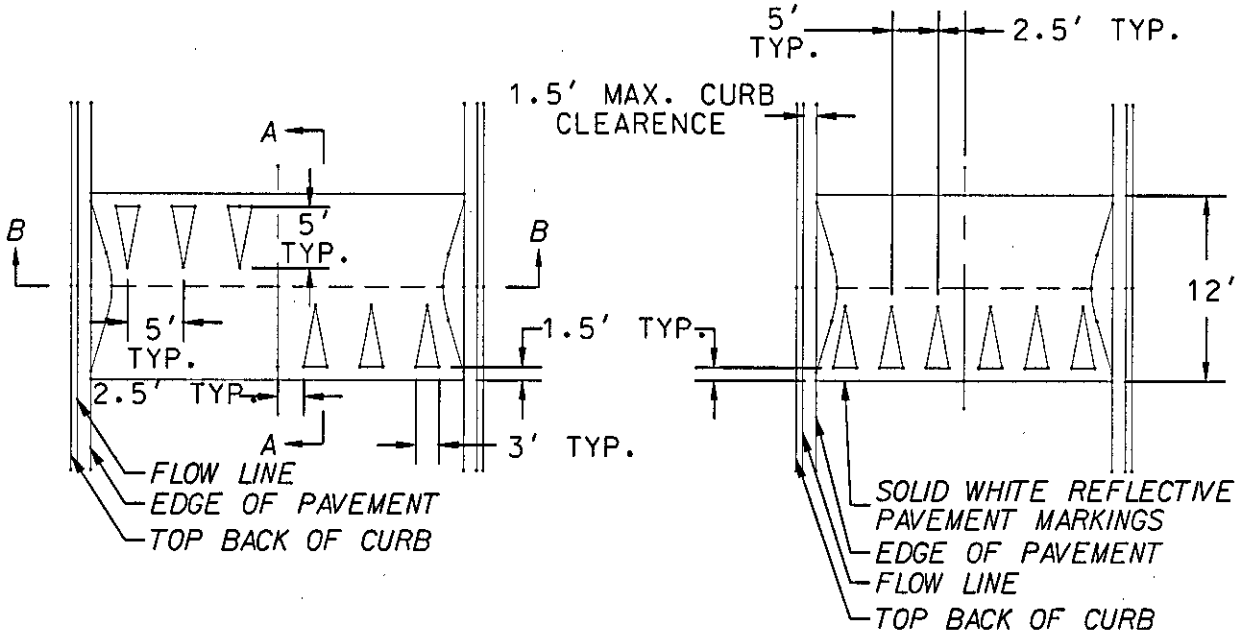
REVISIONS		
DESCRIPTION	NAME	DATE
DIRECTOR		DATE

CITY OF HUNTSVILLE

TYPICAL SPEED TABLE

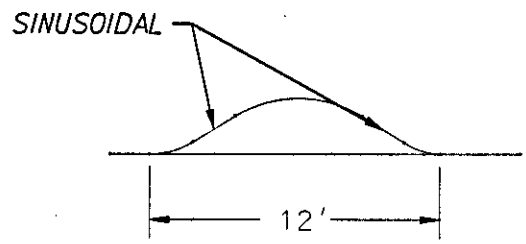
ENGINEER OF PUBLIC WORKS
CITY OF HUNTSVILLE, ALABAMA

TD-3

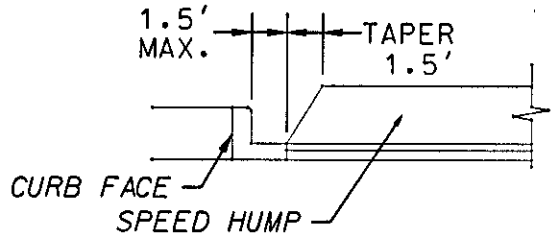


TWO-WAY STREET

ONE-WAY STREET



SECTION A-A



NEW DEVELOPMENT	EXISTING DEVELOPMENT
	X

SECTION B-B

SINUSOIDAL SPEED HUMP DEVELOPMENT

DISTANCE (FT)	0.00	0.50	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50	5.00	5.50	6.00
FINISHED HEIGHT (IN)	0.00	0.48	0.92	1.31	1.67	1.98	2.25	2.48	2.67	2.81	2.92	2.98	3.00

N.T.S.

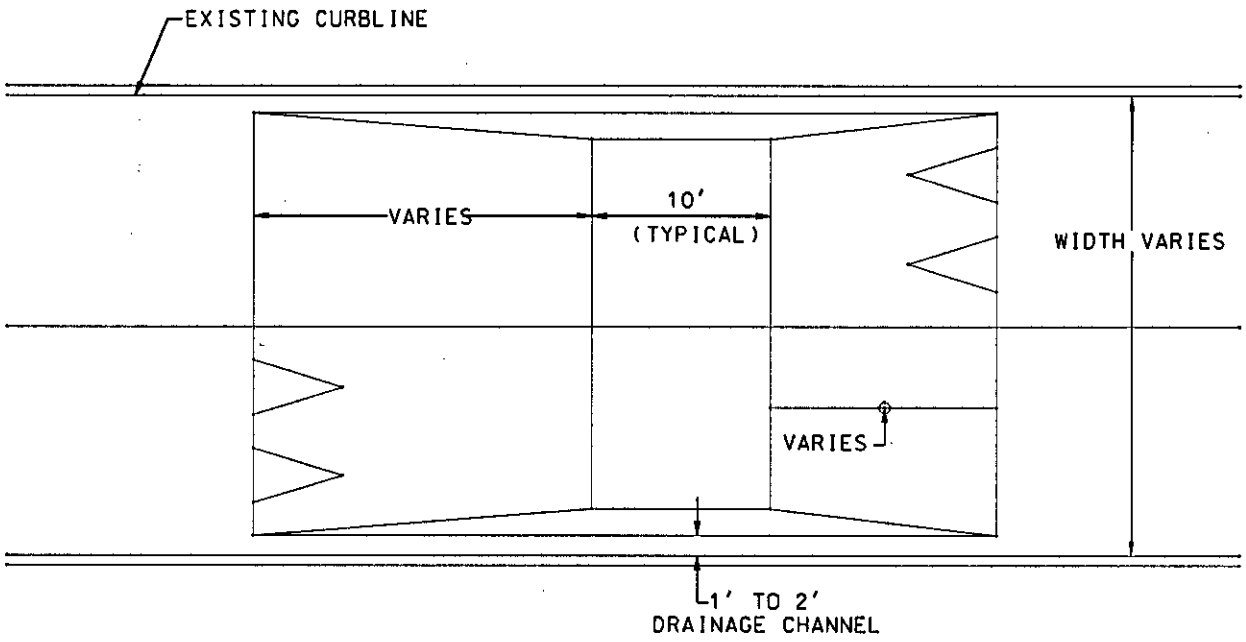
REVISIONS		
DESCRIPTION	NAME	DATE
DIRECTOR		DATE

CITY OF HUNTSVILLE

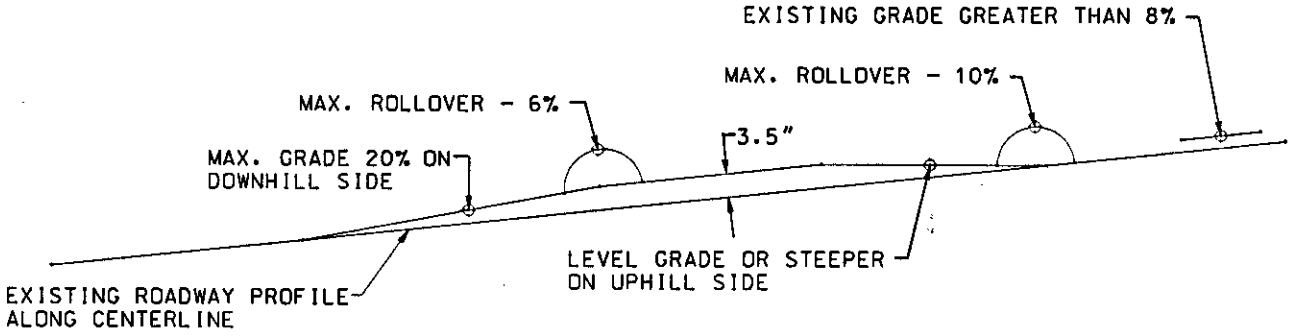
TYPICAL SPEED HUMP

ENGINEER OF PUBLIC WORKS
CITY OF HUNTSVILLE, ALABAMA

TD-4



PLAN



PROFILE

NEW DEVELOPMENT	EXISTING DEVELOPMENT
	X

N.T.S.

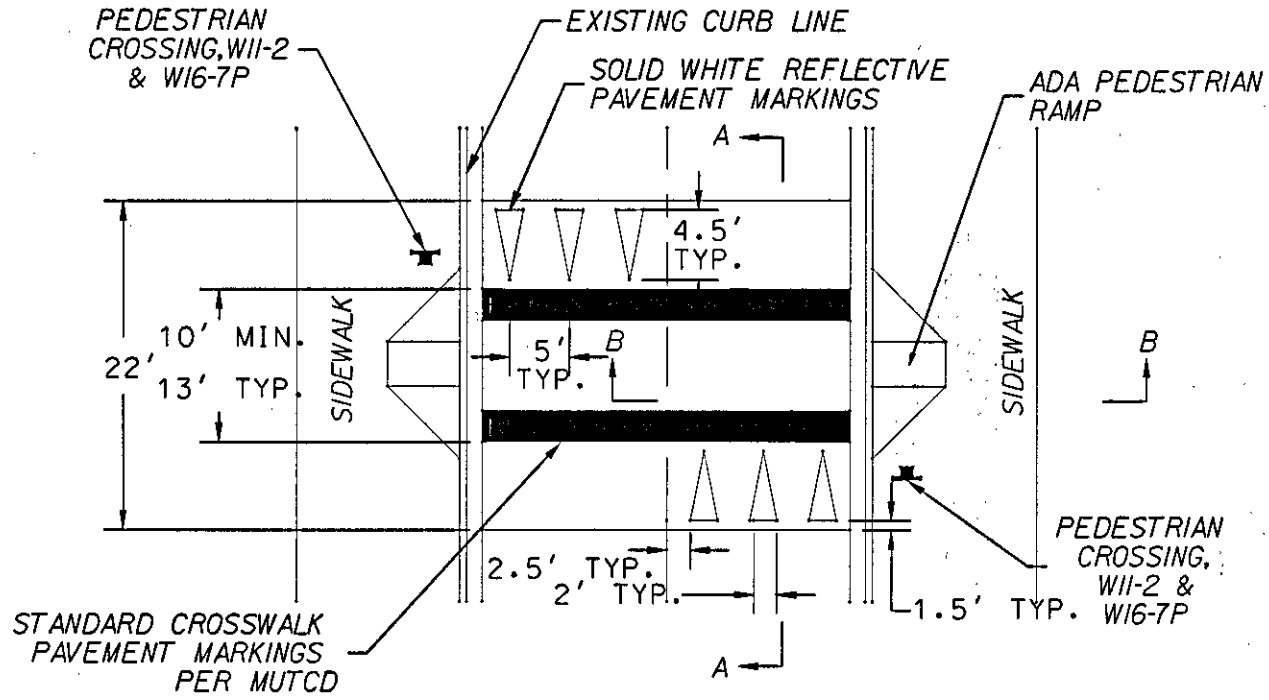
REVISIONS		
DESCRIPTION	NAME	DATE
DIRECTOR		DATE

CITY OF HUNTSVILLE

VERTICAL PROFILE MODIFIED TO BE EFFECTIVE ON AN INCLINE GREATER THAN 8%

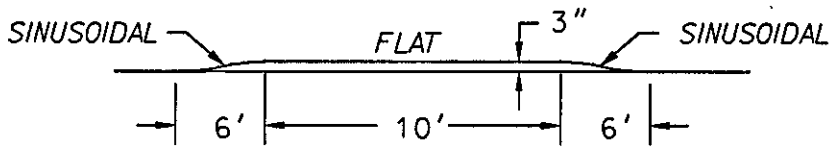
ENGINEER OF PUBLIC WORKS
CITY OF HUNTSVILLE, ALABAMA

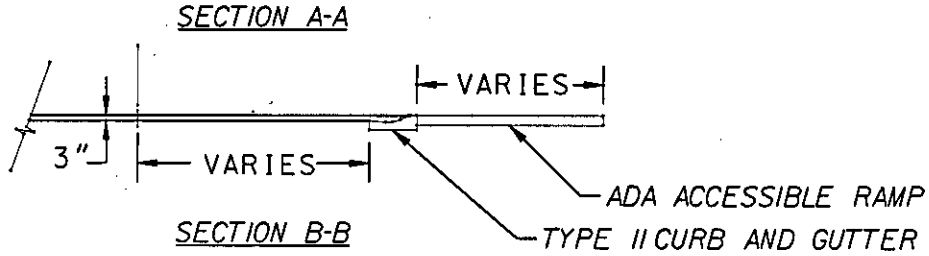
TD-5



STORM DRAIN INLETS ARE REQUIRED ON THE UP HILL SIDE OF A RAISED CROSSWALK.

NEW DEVELOPMENT	EXISTING DEVELOPMENT
X	X





SINUSOIDAL SPEED HUMP DEVELOPMENT

DISTANCE (FT)	0.00	0.41	0.82	1.23	1.64	2.05	2.46	2.87	3.28	3.69	4.10	4.51	4.92	5.33	5.74	6.15	6.55
FINISHED HEIGHT (IN)	0.00	0.04	0.12	0.26	0.47	0.71	0.98	1.26	1.57	1.89	2.17	2.44	2.68	2.87	3.03	3.11	3.15

N.T.S.

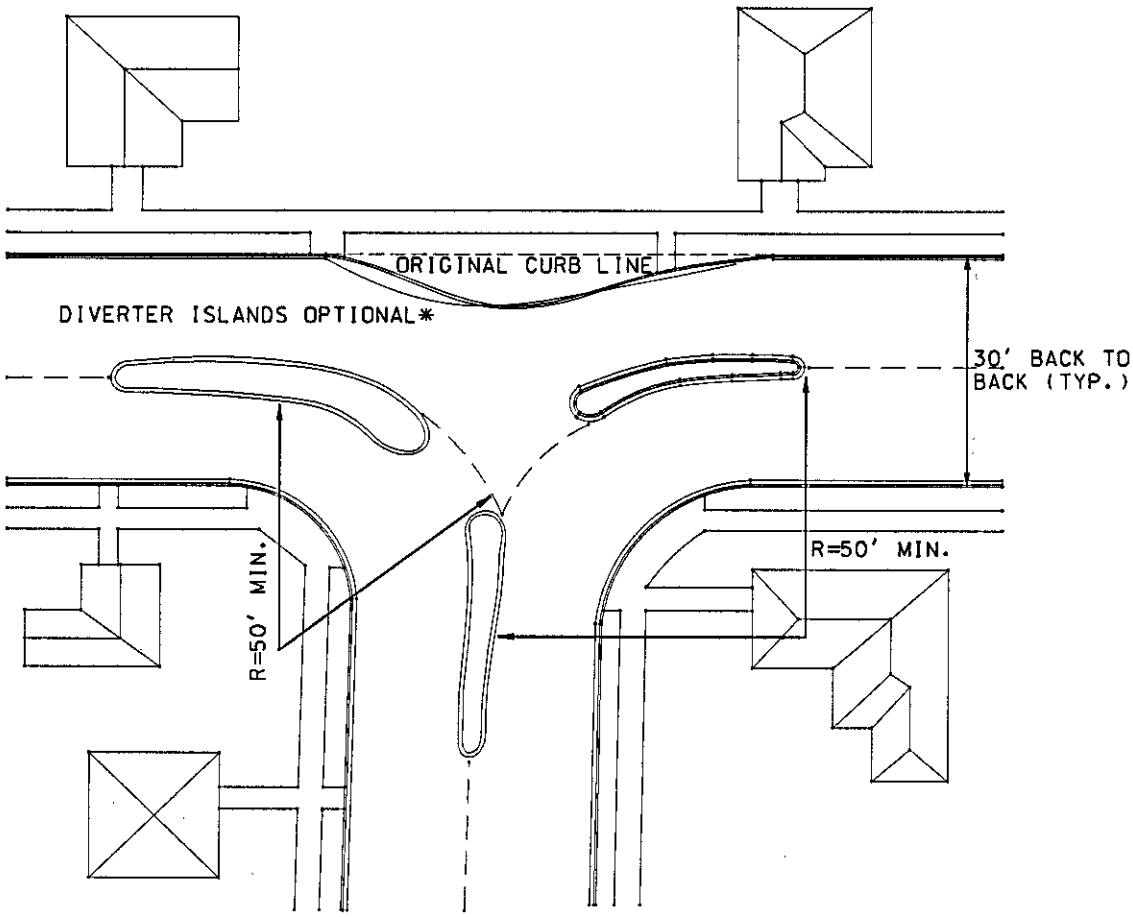
REVISIONS		
DESCRIPTION	NAME	DATE
DIRECTOR		DATE

CITY OF HUNTSVILLE

TYPICAL RAISED CROSSWALK

ENGINEER OF PUBLIC WORKS
CITY OF HUNTSVILLE, ALABAMA

TD-6



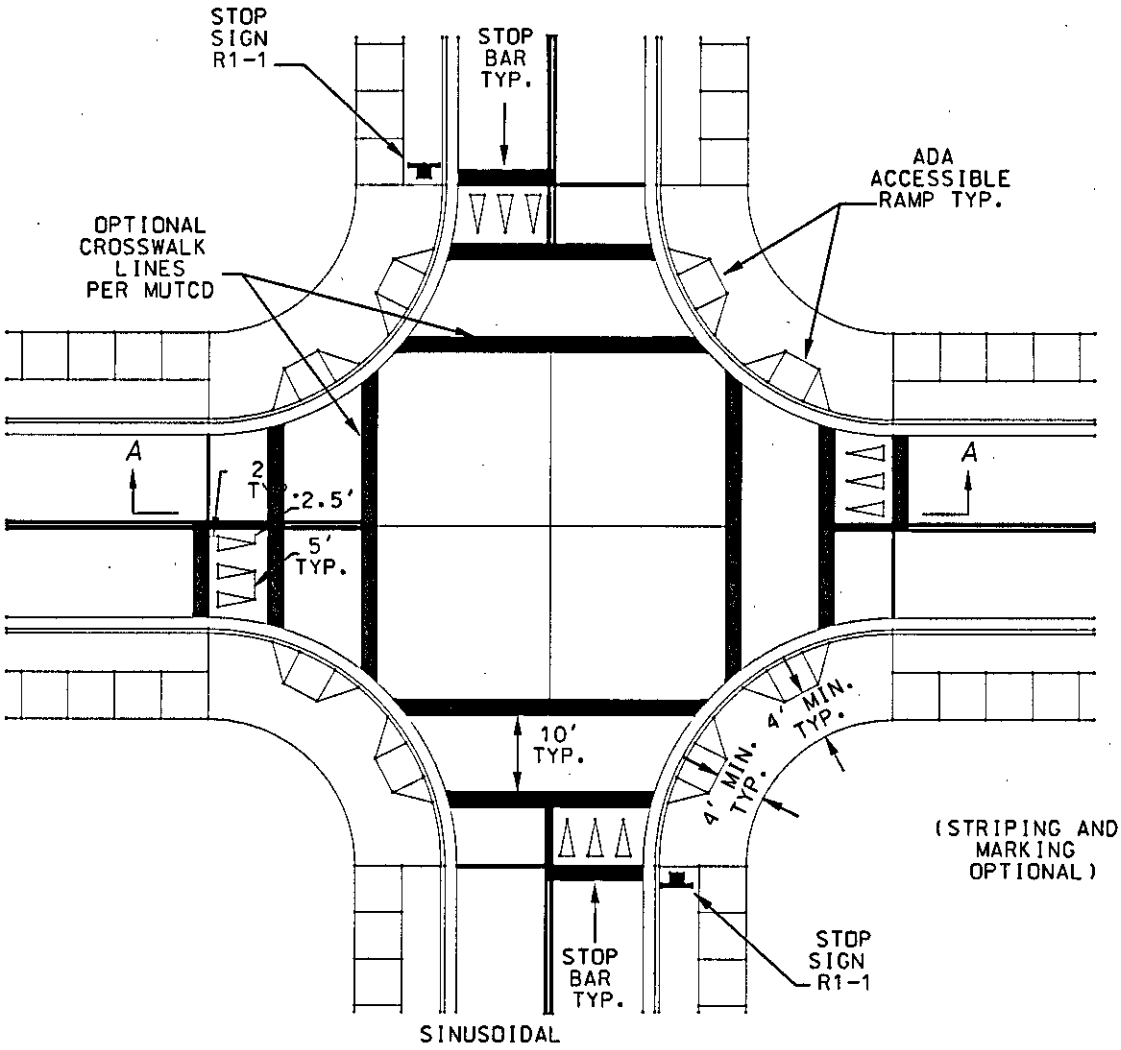
* SITE DEPENDENT

NOTE: STOP OR YEILD SIGNS SHALL BE USED AS APPROPRIATE

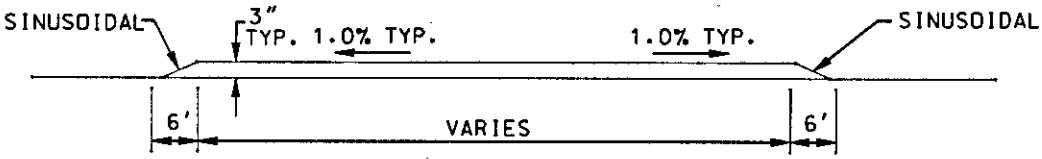
NEW DEVELOPMENT	EXISTING DEVELOPMENT
	X

N.T.S.

REVISIONS			CITY OF HUNTSVILLE	
DESCRIPTION	NAME	DATE	MODIFIED INTERSECTION	
DIRECTOR		DATE	ENGINEER OF PUBLIC WORKS CITY OF HUNTSVILLE, ALABAMA	TD-7



PAVE INTERSECTION TO DRAIN



SECTION A-A

NEW DEVELOPMENT	EXISTING DEVELOPMENT
X	X

N.T.S.

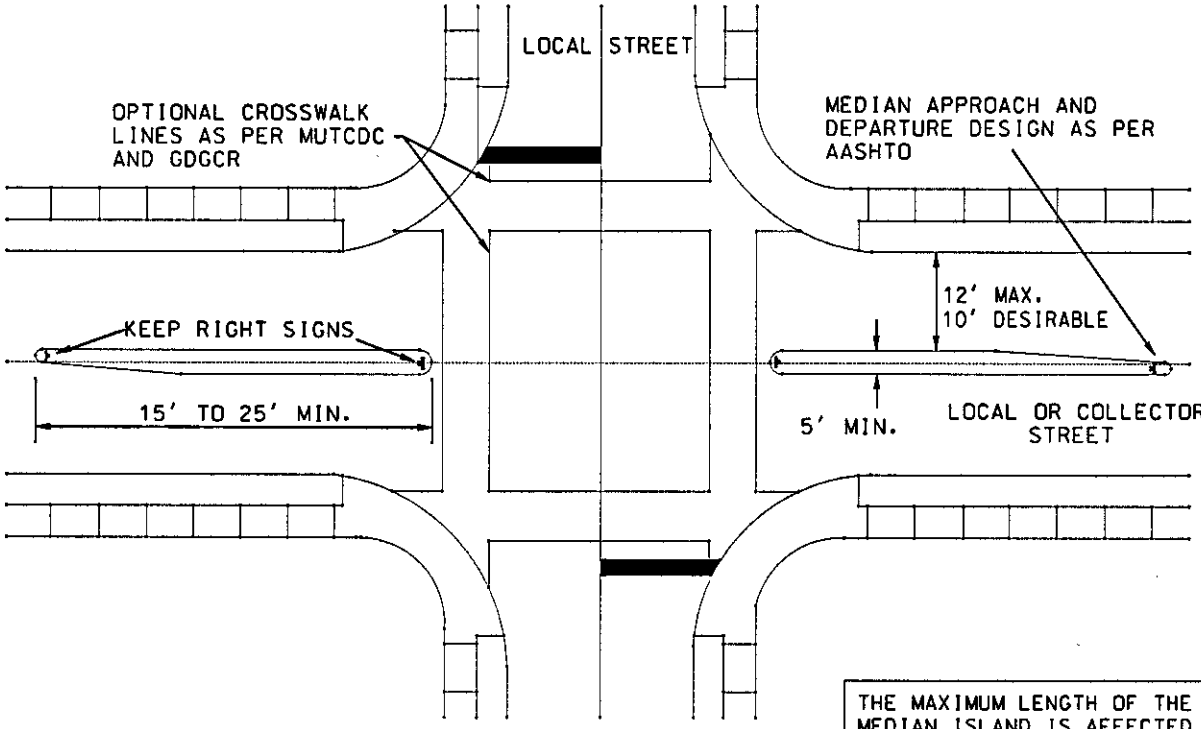
REVISIONS		
DESCRIPTION	NAME	DATE
DIRECTOR		DATE

CITY OF HUNTSVILLE

TYPICAL RAISED INTERSECTION

ENGINEER OF PUBLIC WORKS
CITY OF HUNTSVILLE, ALABAMA

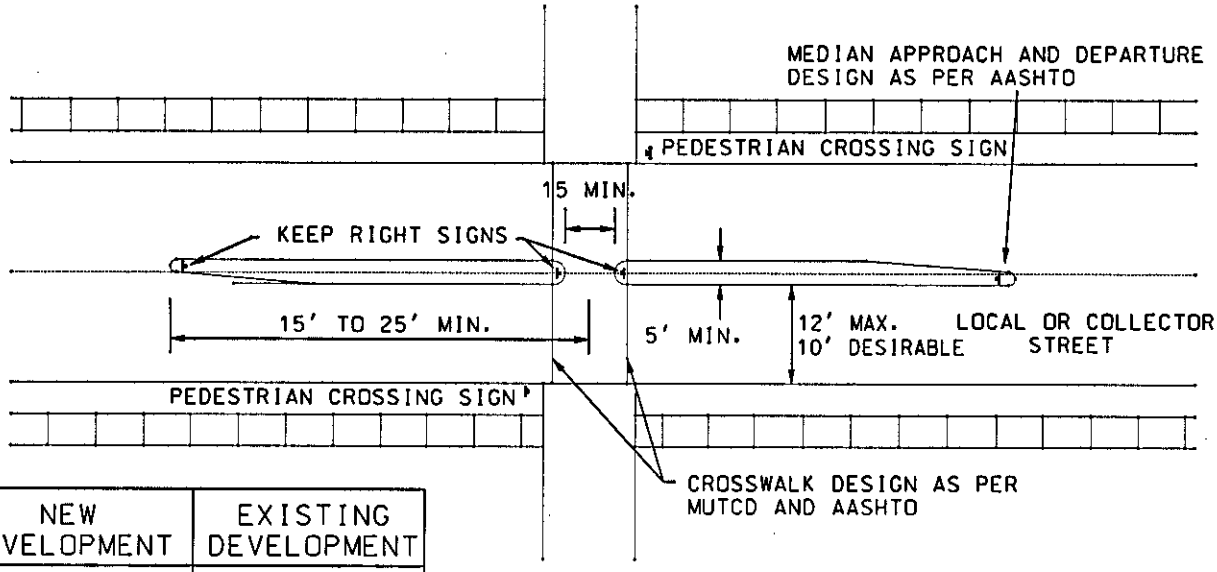
TD-8



LOCAL STREET INTERSECTION

THE MAXIMUM LENGTH OF THE MEDIAN ISLAND IS AFFECTED BY ADJACENT DRIVEWAY AND INTERSECTION LOCATIONS.

ADDITIONAL PARKING PROHIBITED SIGNS MAY BE REQUIRED.



NEW DEVELOPMENT	EXISTING DEVELOPMENT
X	X

MID-BLOCK CROOSWALK

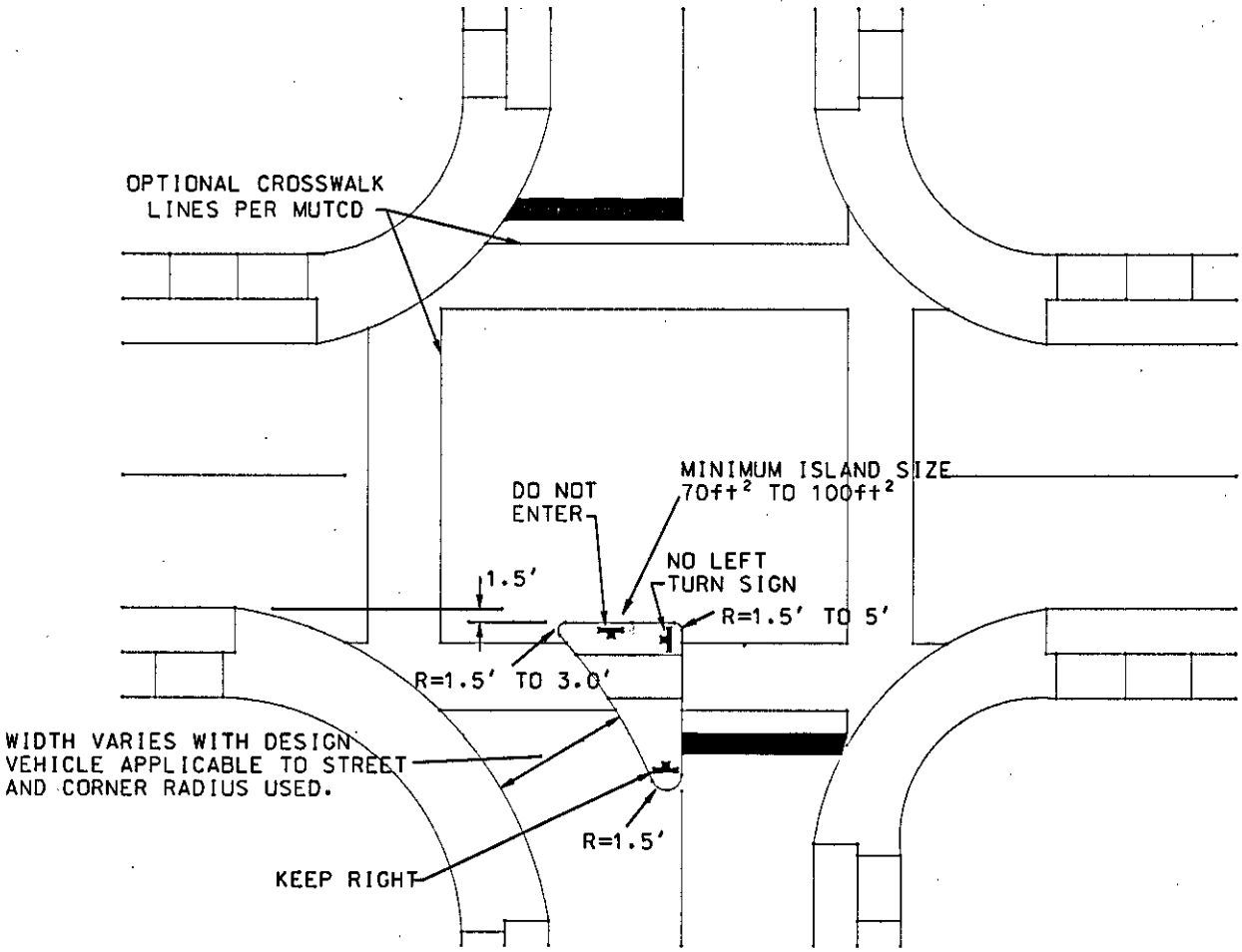
N.T.S.

REVISIONS		
DESCRIPTION	NAME	DATE

CITY OF HUNTSVILLE

RAISED MEDIAN ISLAND

DIRECTOR	DATE	ENGINEER OF PUBLIC WORKS CITY OF HUNTSVILLE, ALABAMA	TD-9



CHANNELIZATION AS PER MUTCD MARKINGS ARE OPTIONAL. THE INTERSECTION CHANNELIZATION ILLUSTRATED HERE DISCOURAGES THROUGH MOVEMENT AND LEFT-TURN MOVEMENTS ONTO ONE LEG OF THE INTERSECTION. A RANGE OF ALTERNATIVES EXIST DEPENDING ON THE CURB RADIUS USED AND WHETHER LARGE VEHICLES NEED TO BE ACCOMMODATED THROUGH THE CHANNELIZED AREA.

NEW DEVELOPMENT	EXISTING DEVELOPMENT
X	X

N.T.S.

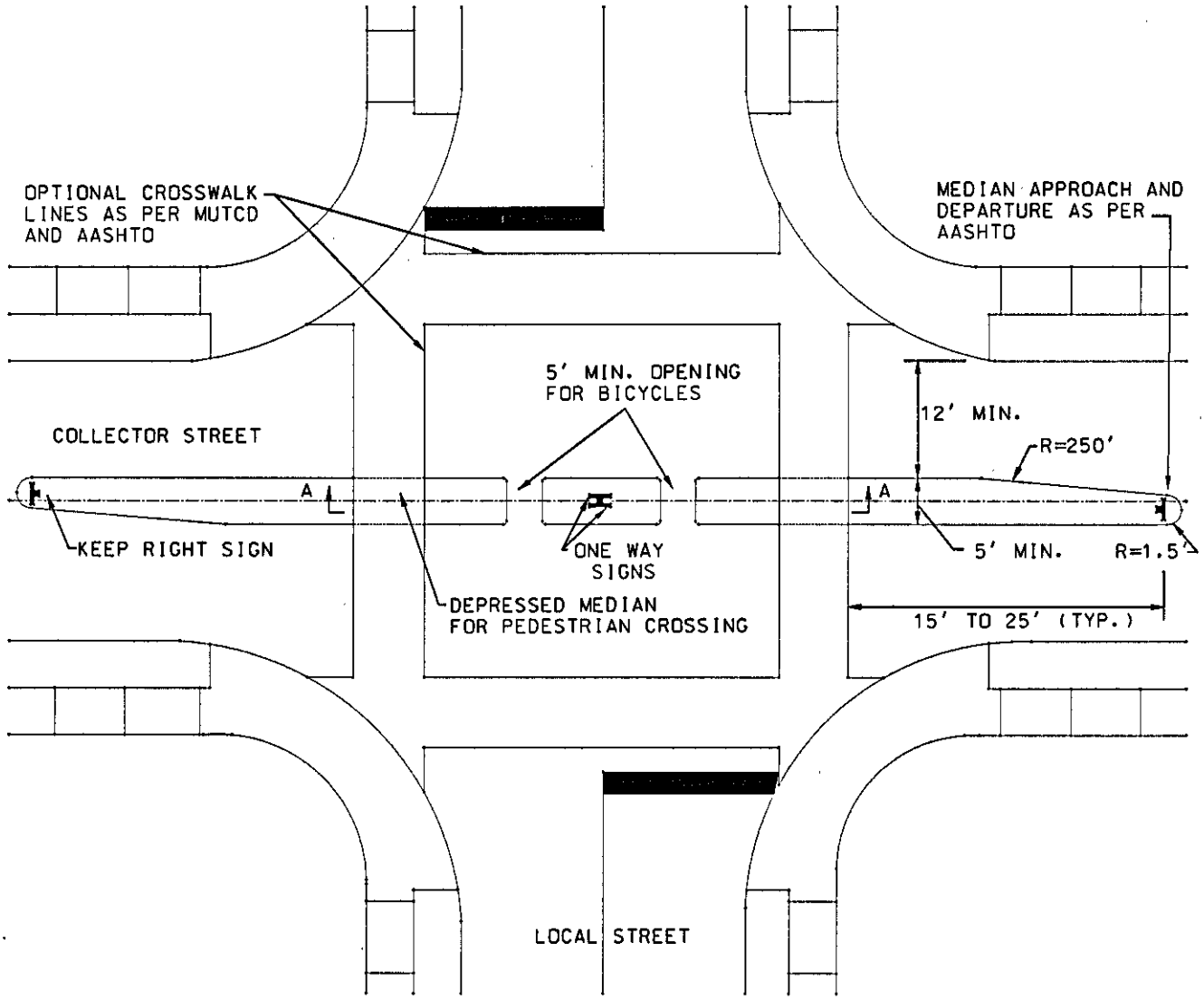
REVISIONS		
DESCRIPTION	NAME	DATE
DIRECTOR		DATE

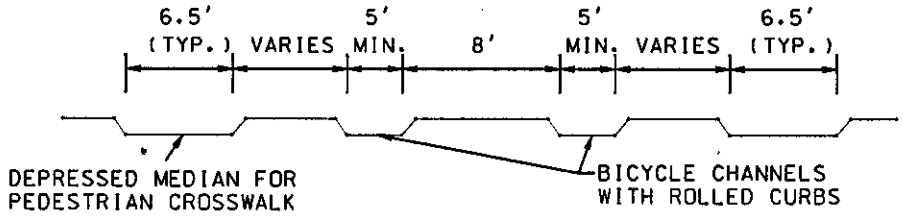
CITY OF HUNTSVILLE

INTERSECTION CHANNELIZATION

ENGINEER OF PUBLIC WORKS
CITY OF HUNTSVILLE, ALABAMA

TD-10





SECTION A-A

NEW DEVELOPMENT	EXISTING DEVELOPMENT
X	X

* BICYCLE OPENING ARE OPTIONAL.
* MARKINGS ARE OPTIONAL.

N.T.S.

REVISIONS		
DESCRIPTION	NAME	DATE
DIRECTOR		DATE

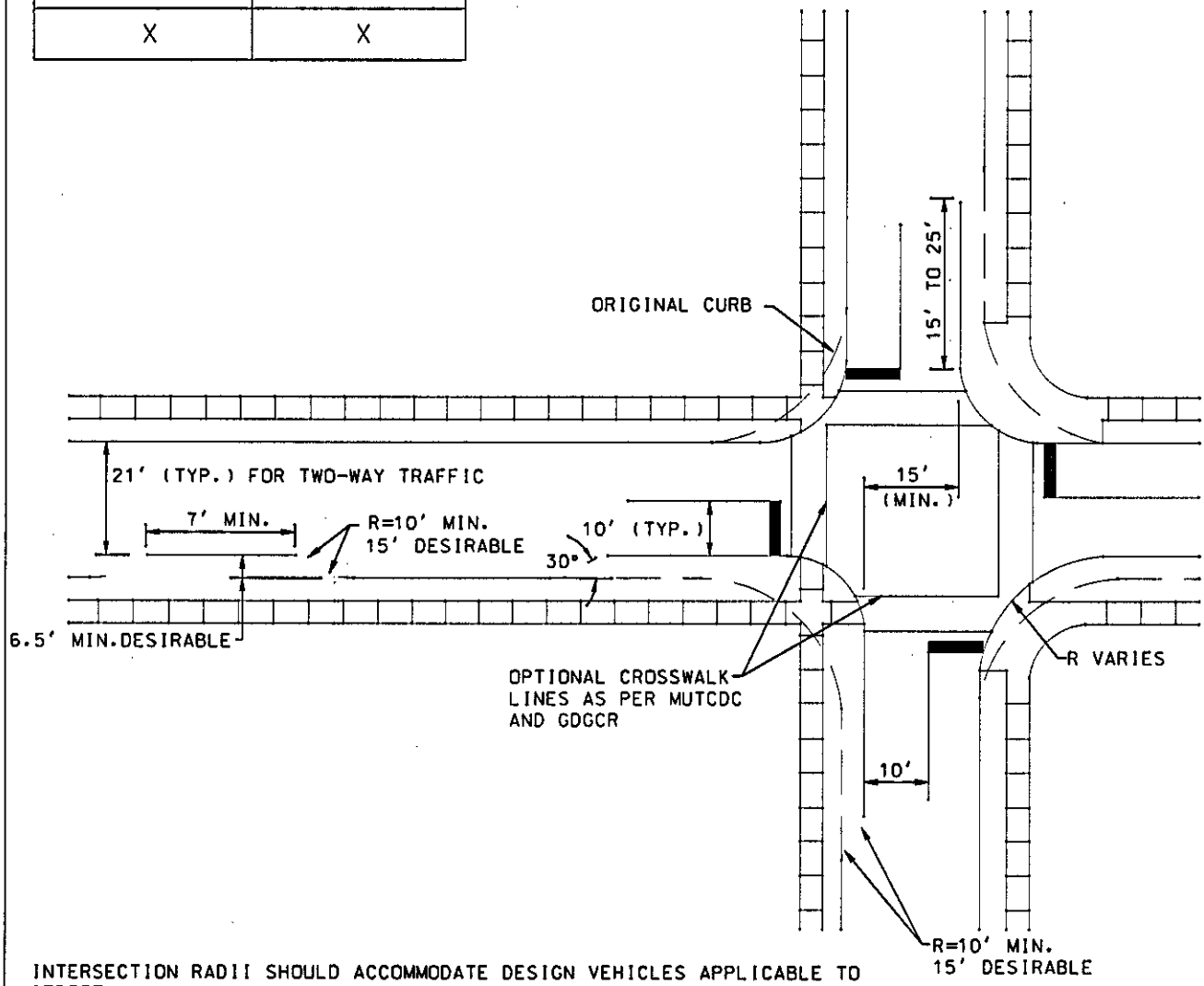
CITY OF HUNTSVILLE

RAISED MEDIAN THROUGH INTERSECTION

ENGINEER OF PUBLIC WORKS
CITY OF HUNTSVILLE, ALABAMA

TD-11

NEW DEVELOPMENT	EXISTING DEVELOPMENT
X	X



INTERSECTION RADII SHOULD ACCOMMODATE DESIGN VEHICLES APPLICABLE TO STREET.

MID-BLOCK CURB EXTENSIONS SHOULD BE COMBINED WITH CROSSWALKS WHERE POSSIBLE.

LENGTH OF CURB EXTENSIONS MUST RECOGNIZE SITE CONDITIONS, E.G., DRIVEWAY LOCATIONS.

DEPENDING ON LOCAL CLIMATE AND PREFERENCE, VERTICAL DELINEATION OTHER THEN OBJECT MARKERS MY BE MORE APPROPRIATE. POSSIBLE LANDSCAPING AND CURB PAINTING.

IF LOCAL CONDITIONS PERMIT, THE LANE WIDTHS AT MID-BLOCK CURB EXTENSIONS CAN BE REDUCED TO A MINIMUM 9' AND THE APPROACH LANE AT AN INTERSECTION CURB EXTENSION CURB EXTENSION CAN BE A MINIMUM OF 8'. IN ALL INSTANCES, THE MINIMUM OVERALL ROADWAY WIDTH SHOULD BE 18'.

IF CURB EXTENSIONS ARE PLACED ON DIAGONALLY OPPOSITE CORNERS OF AN INTERSECTION, A MINIMUM CLEAR OFFSET BETWEEN EXTENSIONS OF 15' SHOULD BE PROVIDED TO MINIMIZE VEHICULAR CONFLICTS WITHIN THE INTERSECTION.

N.T.S.

REVISIONS		
DESCRIPTION	NAME	DATE
DIRECTOR		DATE

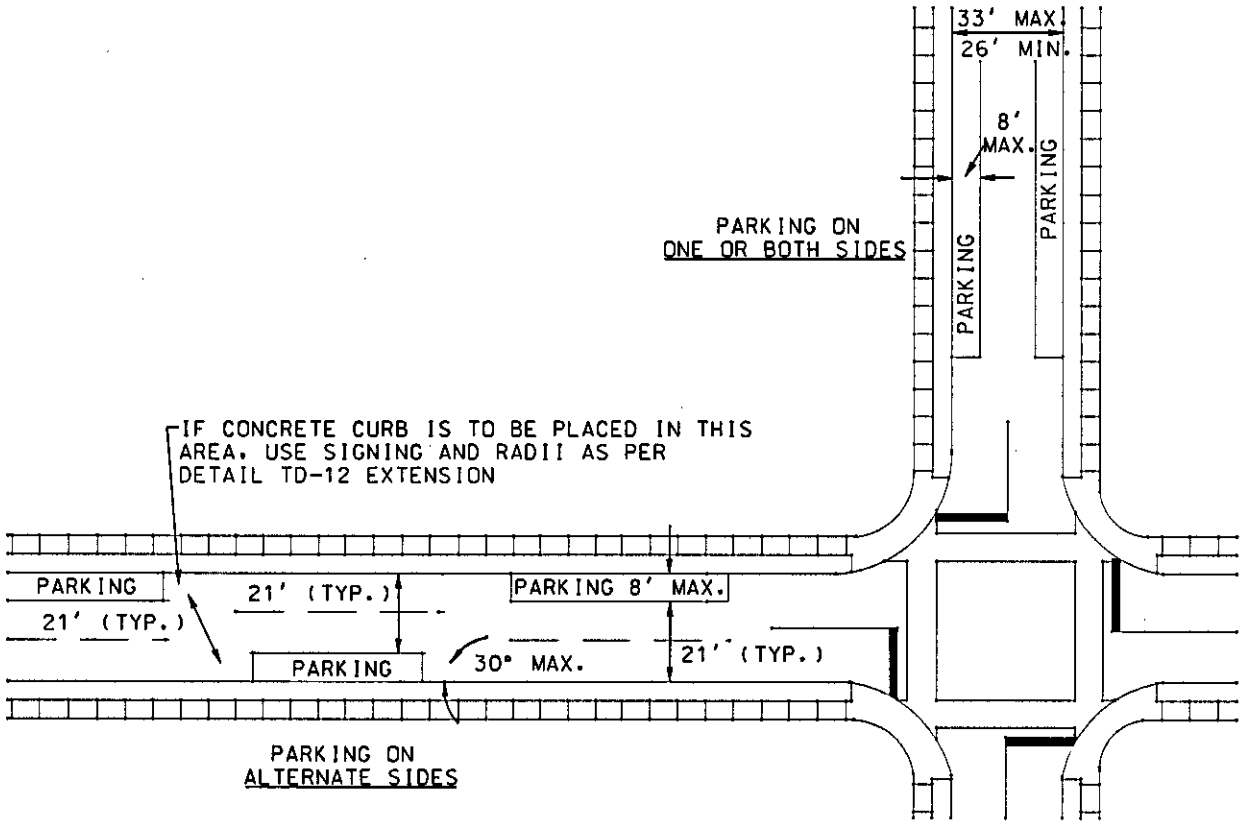
CITY OF HUNTSVILLE

CURB EXTENSION

ENGINEER OF PUBLIC WORKS
CITY OF HUNTSVILLE, ALABAMA

TD-12

NEW DEVELOPMENT	EXISTING DEVELOPMENT
X	X



FOR PARKING SCENARIO THERE PARKING ALTERNATES FROM ONE SIDE OF THE ROADWAY TO THE OTHER. 21 FOOT TYPICAL TWO-LANE WIDTH IS BASED ON TANGENT ALIGNMENT AS OPPOSED TO THE SHARPLY CURVILINEAR ALIGNMENT OF THE CHICANE. FOR SINGLE LANE TRAFFIC THE LANE WIDTH CAN BE REDUCED TO 12 FEET MINIMUM.

FOR THE SCENARIO WITH PARKING ON BOTH SIDES OF THE ROADWAY, THE 33 FEET MAXIMUM ROADWAY WITH APPLIES. FOR THE SCENARIO WITH PARKING ON ONE SIDE OF THE ROADWAY, THE 26 FEET ROADWAY WIDTH APPLIES.

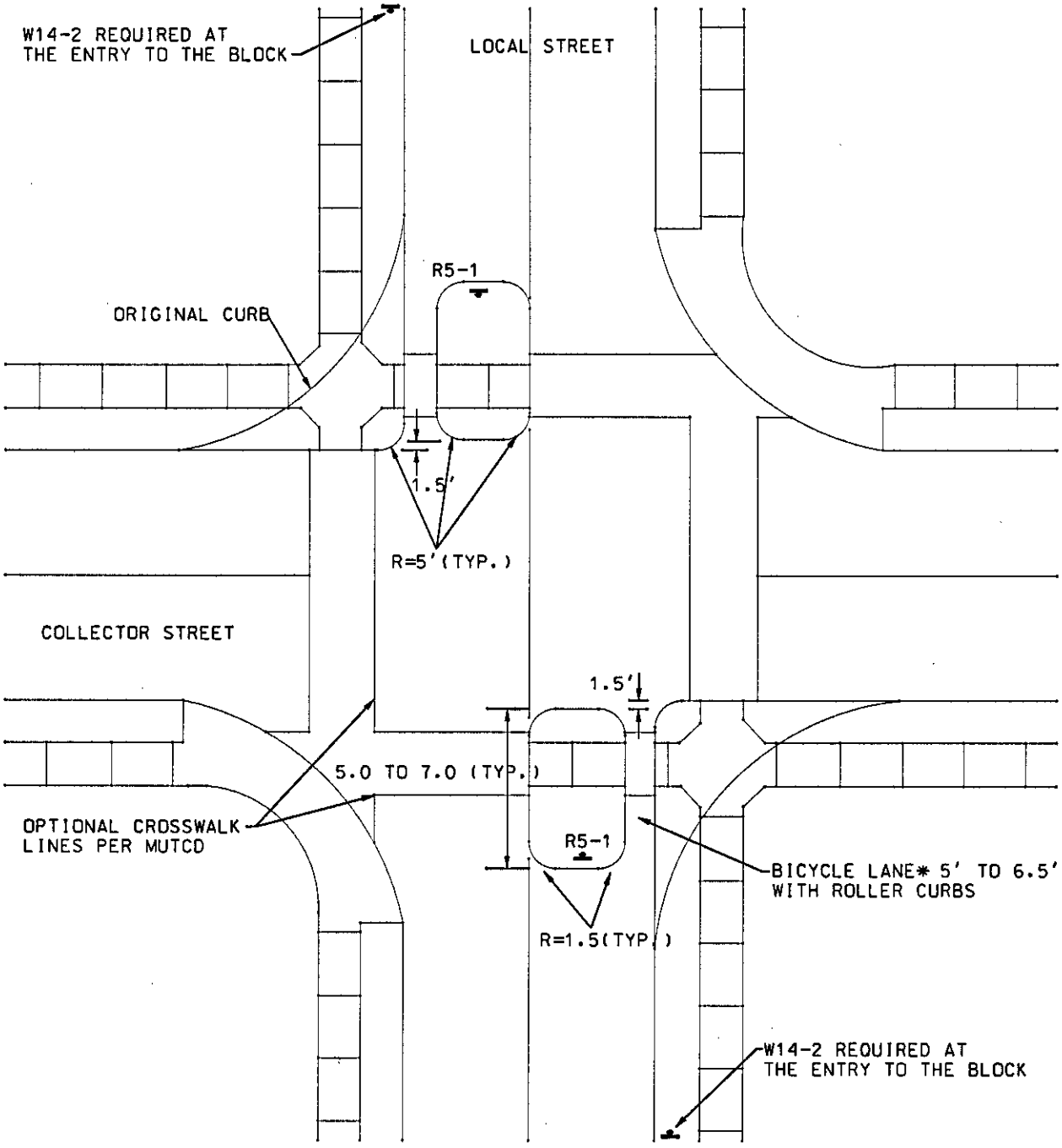
THE DIMENSIONS SHOWN ARE REFLECTIVE OF COLLECTOR STREET REQUIREMENTS. FOR LOW VOLUME LOCAL RESIDENTIAL STREETS, MINIMUM WIDTHS AS LOW AS 14 FEET FOR TWO-WAY TRAFFIC AND 7 FEET FOR PARKING MAY APPLY. SUCH WIDTHS, HOWEVER, MAY NOT ALLOW TWO DIRECTIONAL TRAFFIC TO PASS AT THE SAME TIME IF THERE ARE VEHICLES PARKED ON STREET.

LOCATION OF PARKING BLOCKS MUST RECOGNIZE LOCAL RESTRICTIONS CLOSE TO INTERSECTIONS AND SITE CONDITION, E.G., DRIVEWAY LOCATIONS.

FOR THE CHICANE PARKING SCENARIO, ADDITIONAL PARKING PROHIBITED SIGNS MAY BE REQUIRED TO SATISFY LOCAL CONVENTION.

N.T.S.

REVISIONS			CITY OF HUNTSVILLE	
DESCRIPTION	NAME	DATE	ON-STREET PARKING	
DIRECTOR		DATE	ENGINEER OF PUBLIC WORKS CITY OF HUNTSVILLE, ALABAMA	TD-13



*BICYCLE LANE OPTIONAL

NEW DEVELOPMENT	EXISTING DEVELOPMENT
	X

N.T.S.

REVISIONS		
DESCRIPTION	NAME	DATE

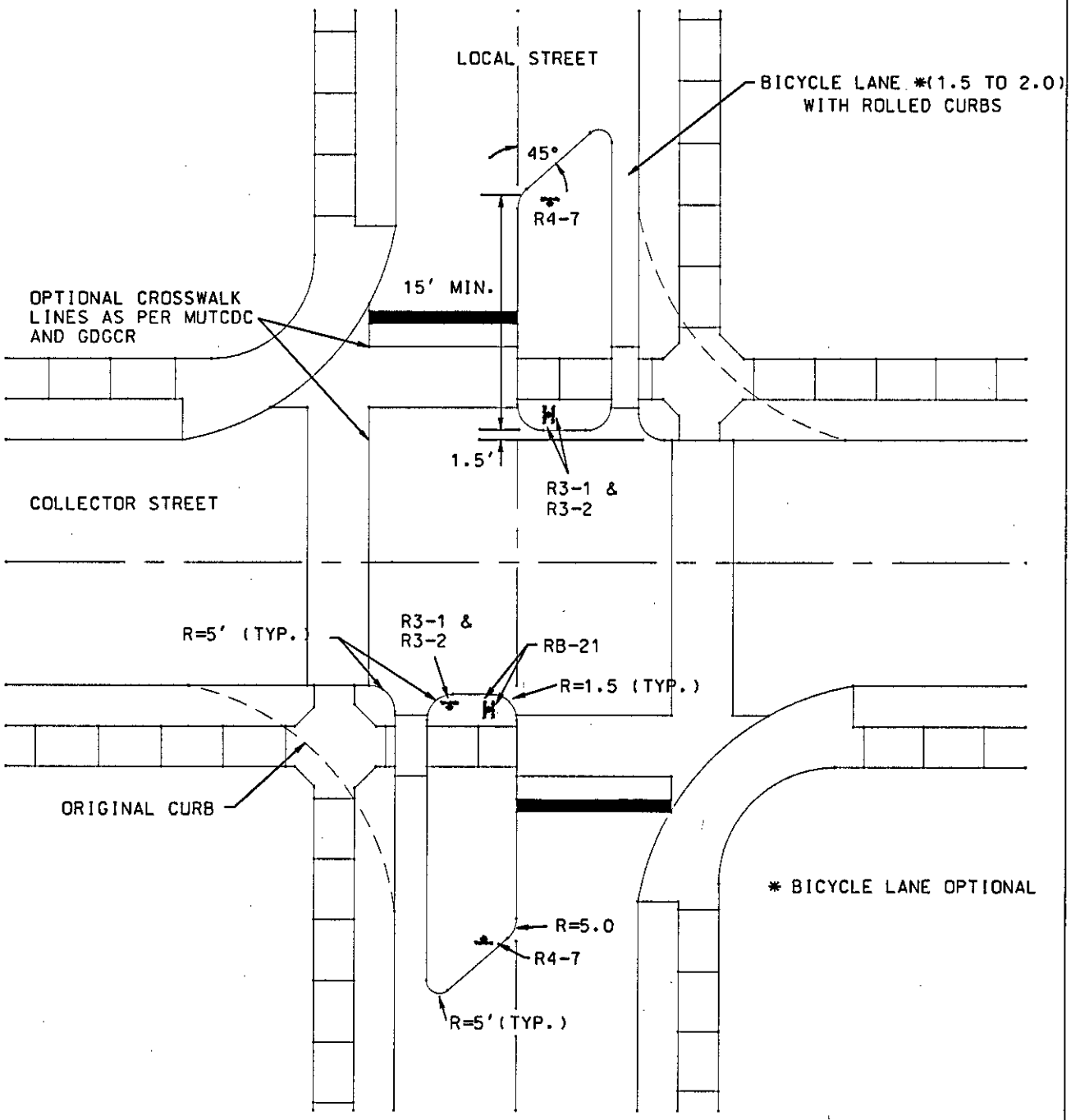
CITY OF HUNTSVILLE

DIRECTIONAL CLOSURE (ENTRANCE ONLY)

DIRECTOR — DATE

ENGINEER OF PUBLIC WORKS
CITY OF HUNTSVILLE, ALABAMA

TD-14



NEW DEVELOPMENT	EXISTING DEVELOPMENT
	X

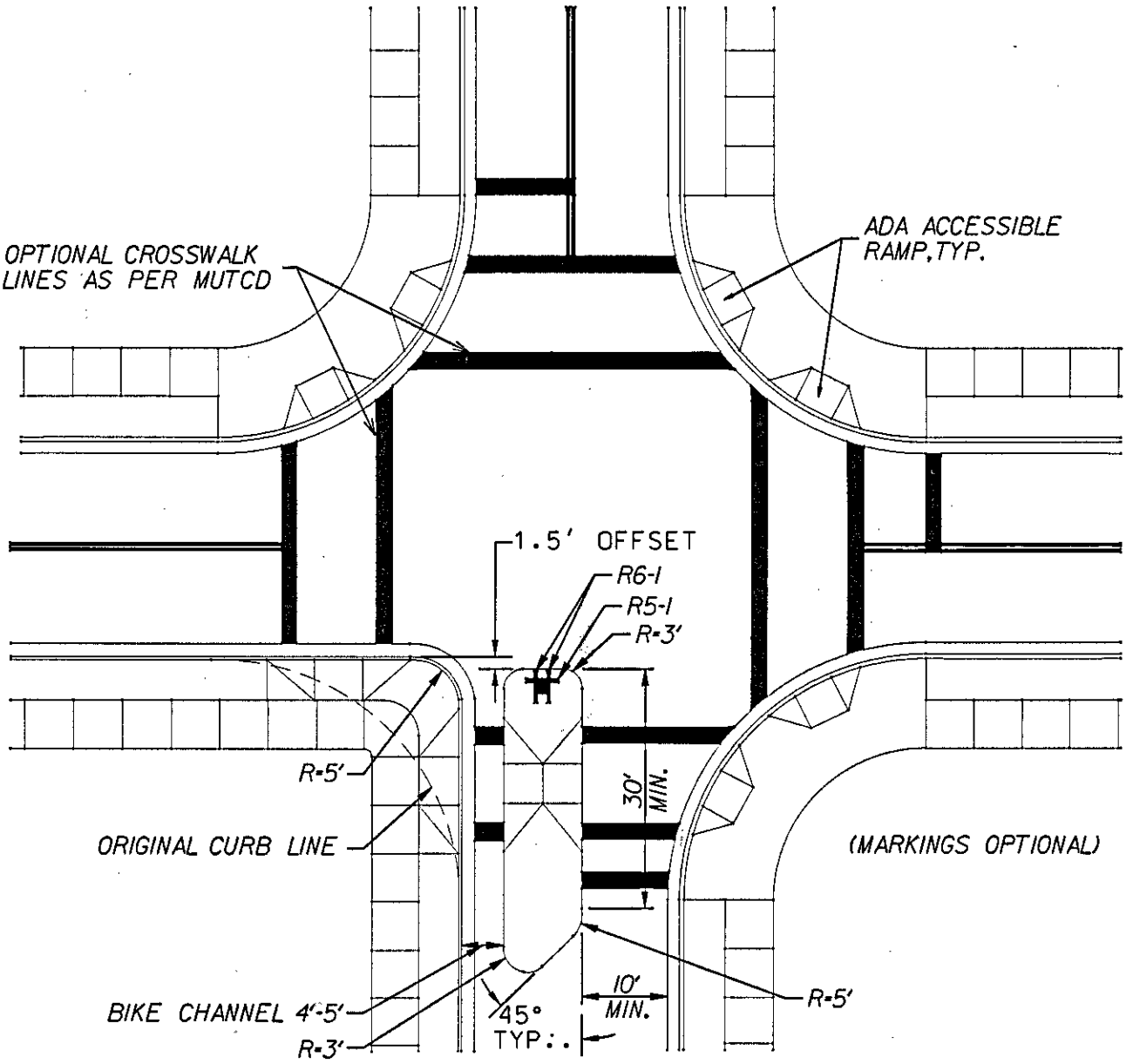
N.T.S.

REVISIONS		
DESCRIPTION	NAME	DATE

CITY OF HUNTSVILLE

DIRECTIONAL CLOSURE (EXIT ONLY)

DIRECTOR	DATE	ENGINEER OF PUBLIC WORKS CITY OF HUNTSVILLE, ALABAMA	TD-15



NEW DEVELOPMENT	EXISTING DEVELOPMENT
X	X

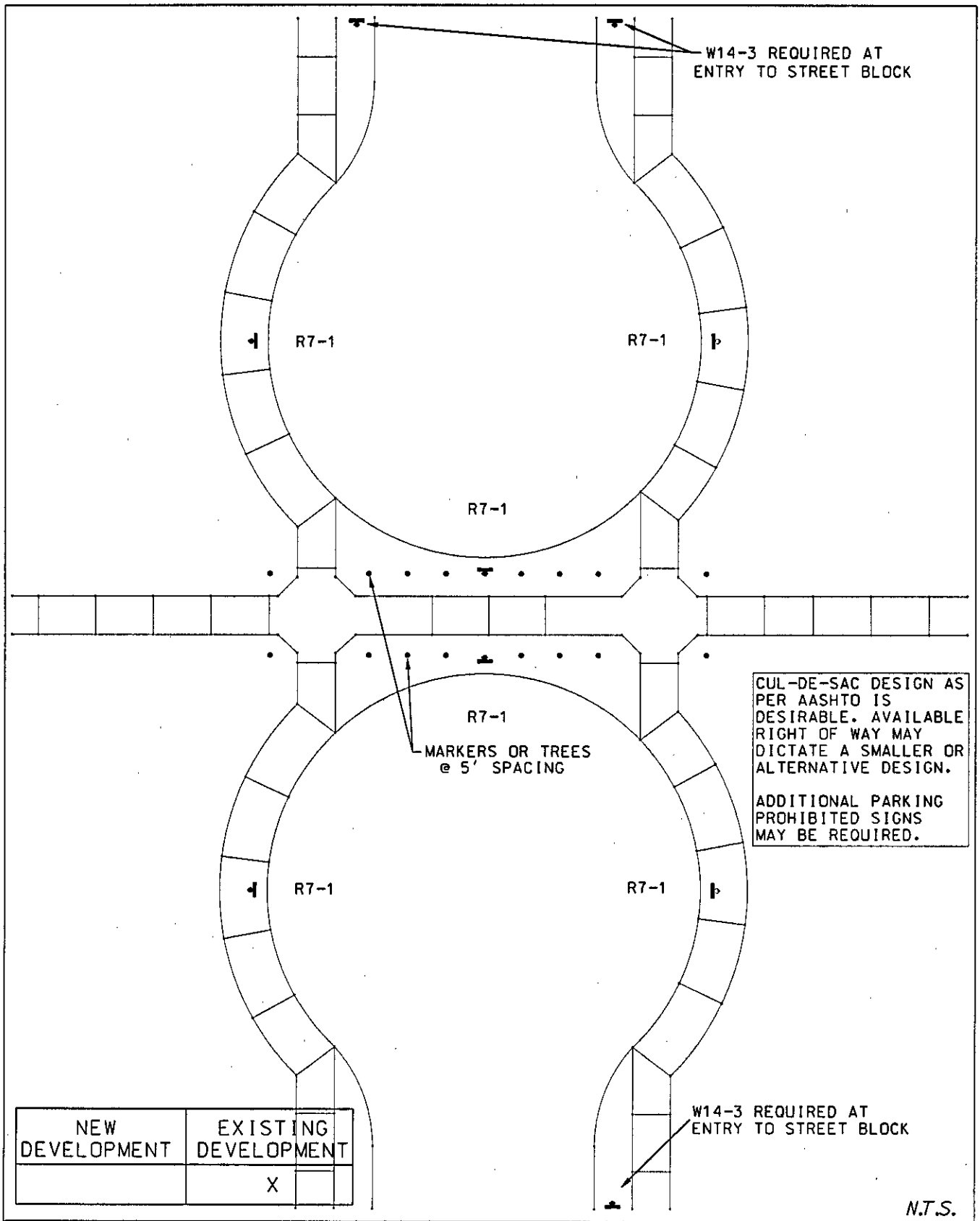
N.T.S.

REVISIONS		
DESCRIPTION	NAME	DATE

CITY OF HUNTSVILLE

TYPICAL HALF CLOSURE

DIRECTOR	DATE	ENGINEER OF PUBLIC WORKS CITY OF HUNTSVILLE, ALABAMA	TD-16



NEW DEVELOPMENT	EXISTING DEVELOPMENT
	X

N.T.S.

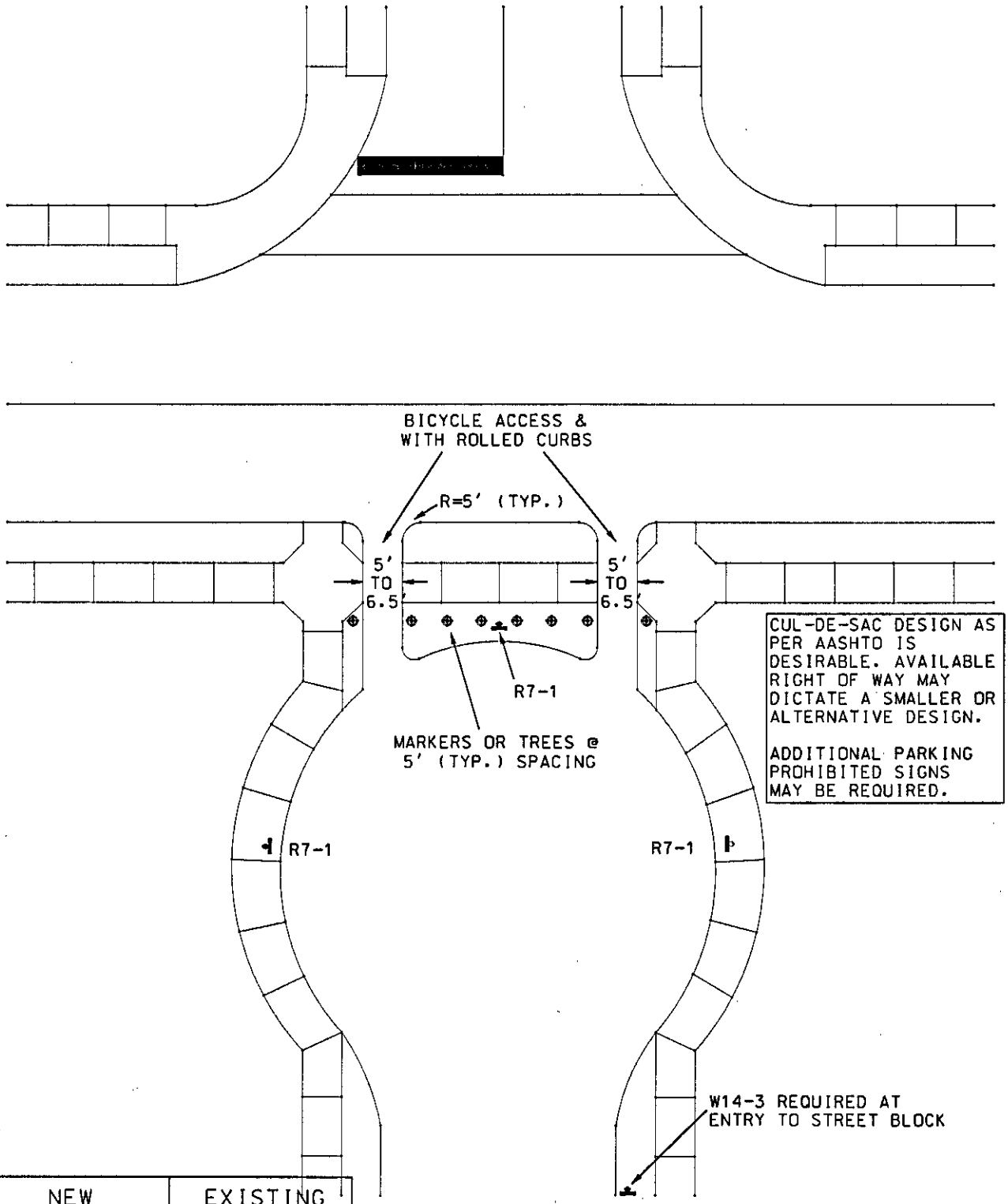
REVISIONS		
DESCRIPTION	NAME	DATE
DIRECTOR		DATE

CITY OF HUNTSVILLE

MIDBLOCK FULL CLOSURE

ENGINEER OF PUBLIC WORKS
CITY OF HUNTSVILLE, ALABAMA

TD-17



NEW DEVELOPMENT	EXISTING DEVELOPMENT
	X

* BICYCLE LANE OPTIONAL

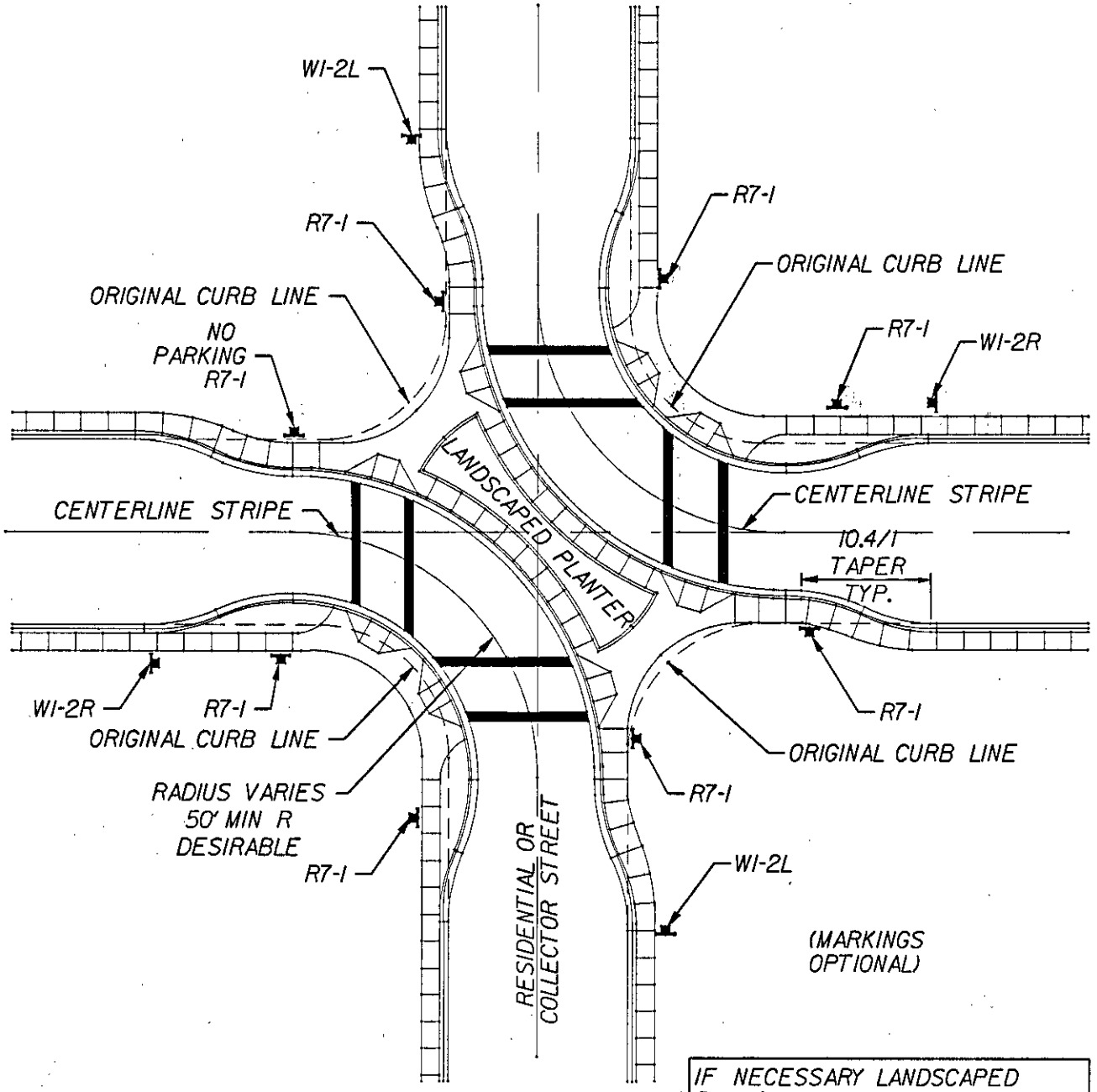
N.T.S.

REVISIONS		
DESCRIPTION	NAME	DATE

CITY OF HUNTSVILLE

FULL CLOSURE

DIRECTOR	DATE	ENGINEER OF PUBLIC WORKS CITY OF HUNTSVILLE, ALABAMA	TD-18



IF NECESSARY LANDSCAPED PLANTER MAY BE REDUCED AND MOUNTABLE CURB INSTALLED TO PROVIDE ACCESS FOR EMERGENCY VEHICLES.

NEW DEVELOPMENT	EXISTING DEVELOPMENT
	X

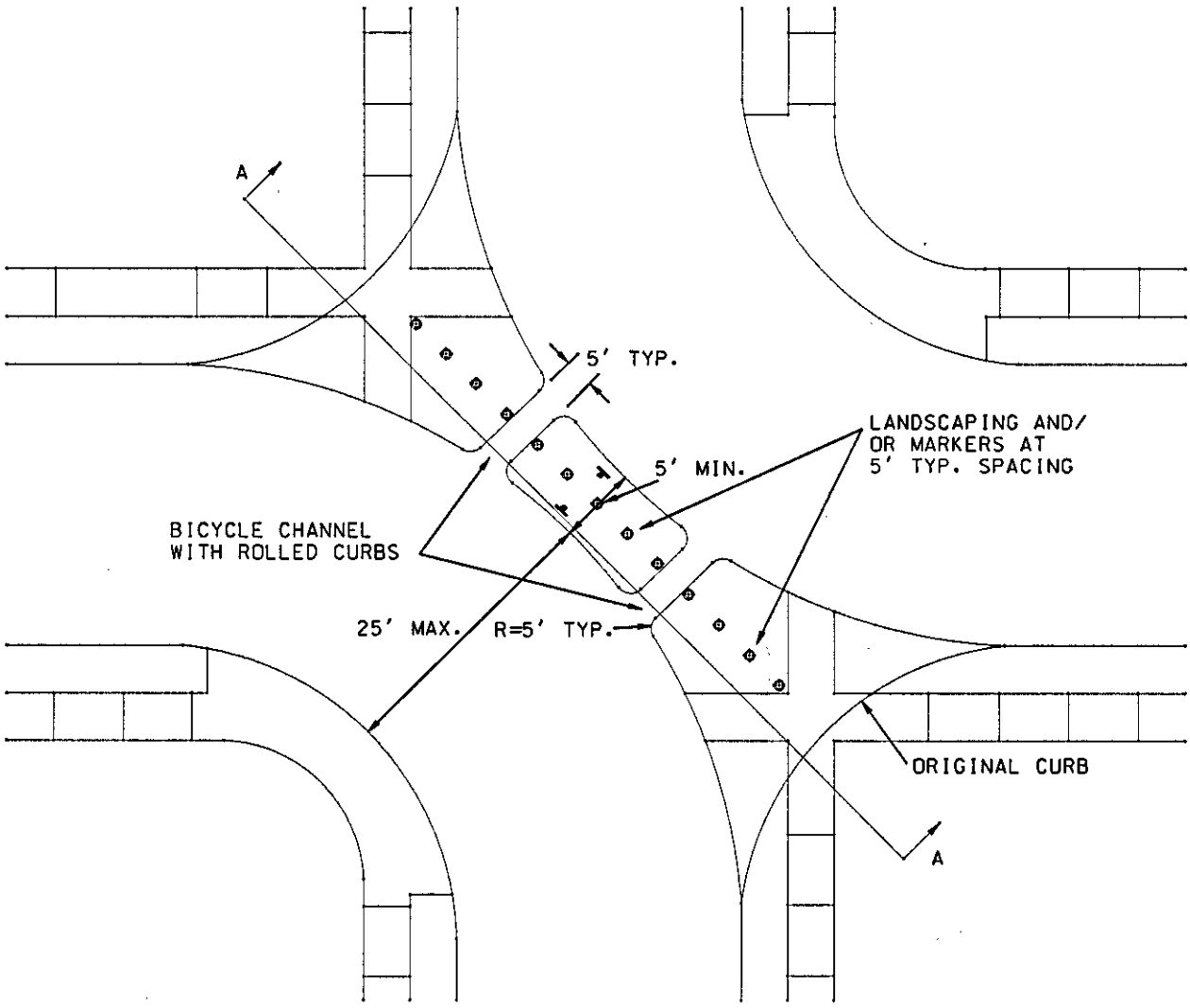
N.T.S.

REVISIONS		
DESCRIPTION	NAME	DATE

CITY OF HUNTSVILLE

TYPICAL DIAGONAL DIVERTER

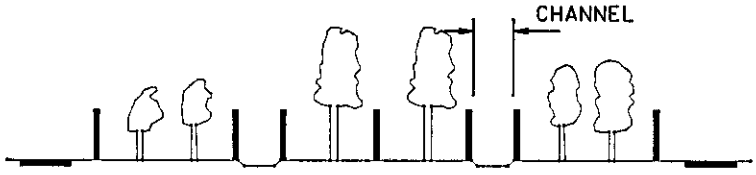
DIRECTOR	DATE	ENGINEER OF PUBLIC WORKS CITY OF HUNTSVILLE, ALABAMA	TD-19



NEW DEVELOPMENT	EXISTING DEVELOPMENT
	X

DEPENDING ON PEDESTRIAN DEMAND AND OTHER LOCAL CONDITIONS. THE DIVERTER DESIGN CAN BE MODIFIED TO ACCOMMODATE A SIDEWALK ALONG ITS LENGTH. LANDSCAPING AND/OR BOLLARDS TO BE RETAINED

EMERGENY VEHICLES CAN BE ACCOMMODATED BY USE OF BREAK-AWAY OR LOCKABLE BOLLARDS. OR LOCKABLE GATES.



SECTION A-A

N.T.S.

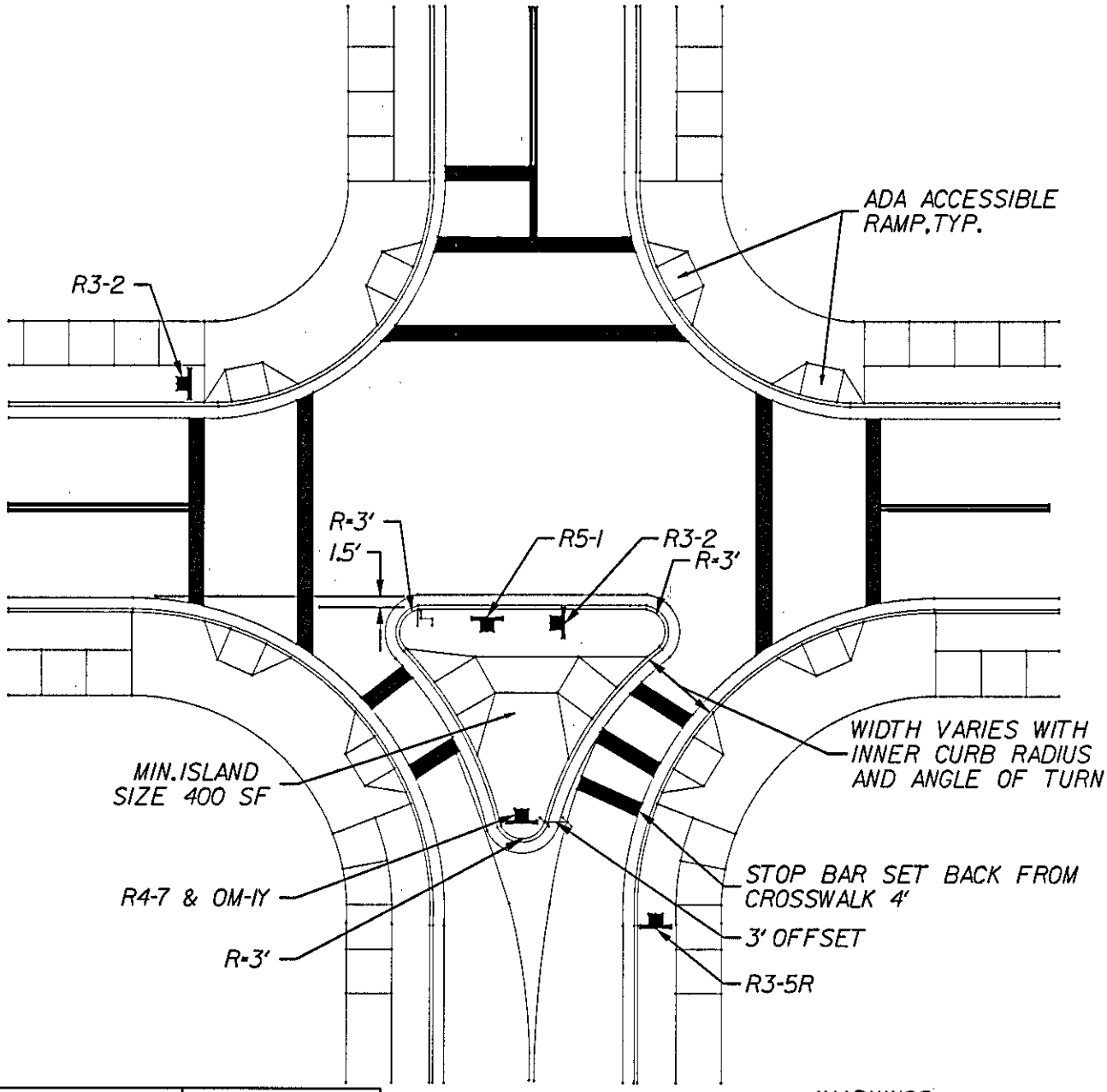
REVISIONS		
DESCRIPTION	NAME	DATE
DIRECTOR		DATE

CITY OF HUNTSVILLE

DIVERTER (ALTERNATE DESIGN)

ENGINEER OF PUBLIC WORKS
CITY OF HUNTSVILLE, ALABAMA

TD-20



NEW DEVELOPMENT	EXISTING DEVELOPMENT
X	X

(MARKINGS OPTIONAL)

N.T.S.

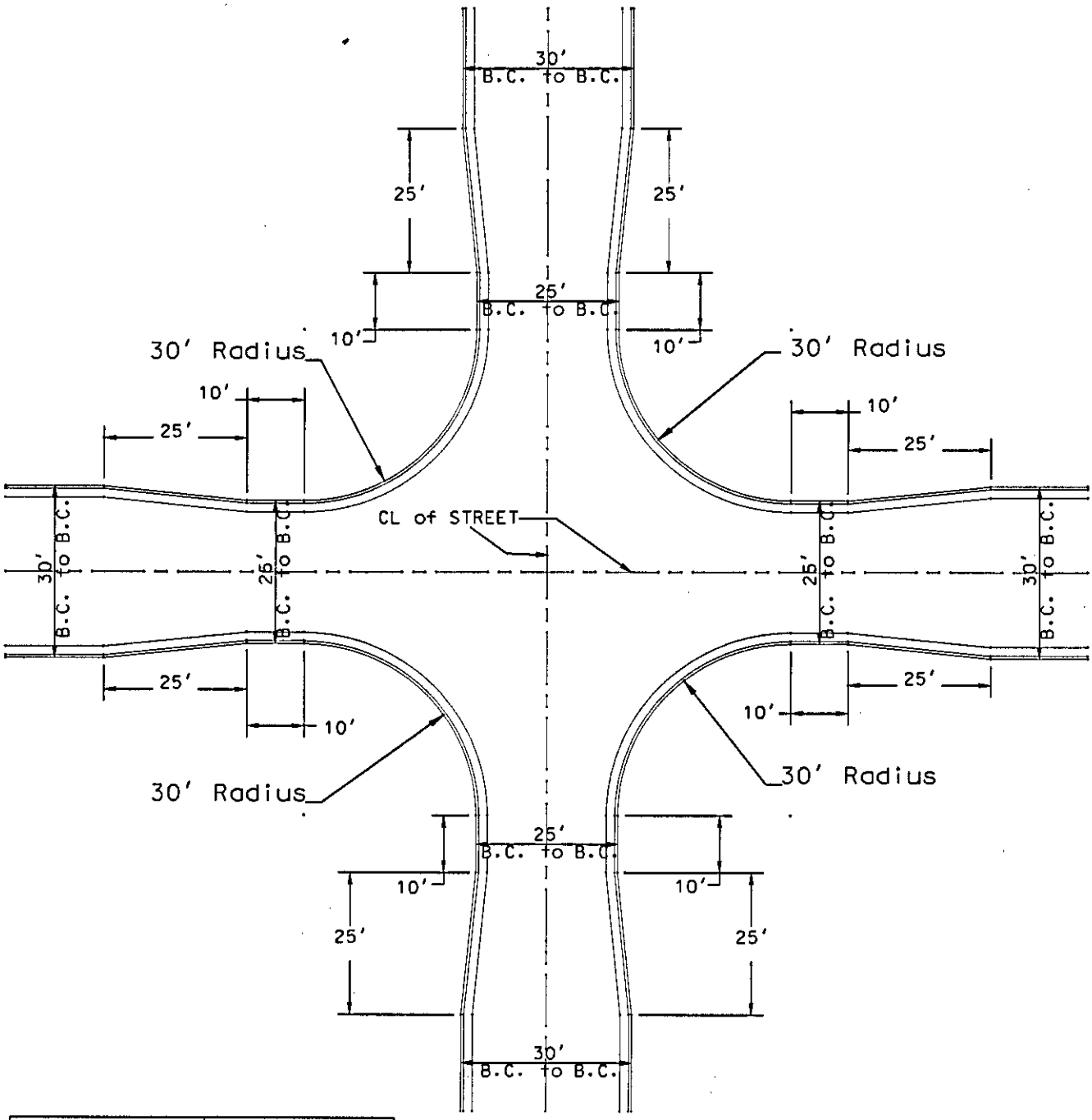
REVISIONS		
DESCRIPTION	NAME	DATE
DIRECTOR		DATE

CITY OF HUNTSVILLE

TYPICAL FORCED TURN ISLAND

ENGINEER OF PUBLIC WORKS
CITY OF HUNTSVILLE, ALABAMA

TD-21



NEW DEVELOPMENT	EXISTING DEVELOPMENT
X	X

N.T.S.

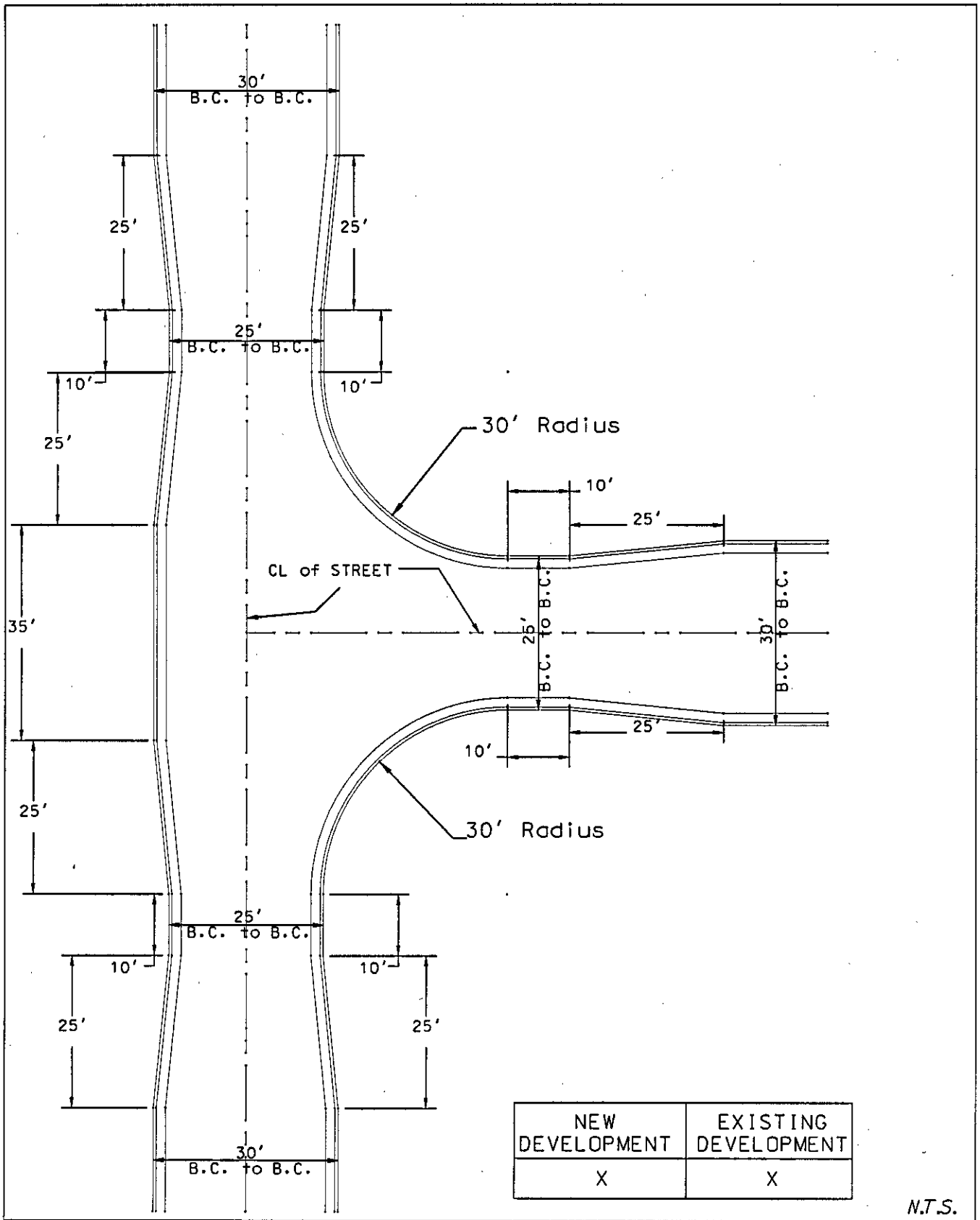
REVISIONS		
DESCRIPTION	NAME	DATE
DIRECTOR		DATE

CITY OF HUNTSVILLE

NECKDOWN

ENGINEER OF PUBLIC WORKS
CITY OF HUNTSVILLE, ALABAMA

TD-22



NEW DEVELOPMENT	EXISTING DEVELOPMENT
X	X

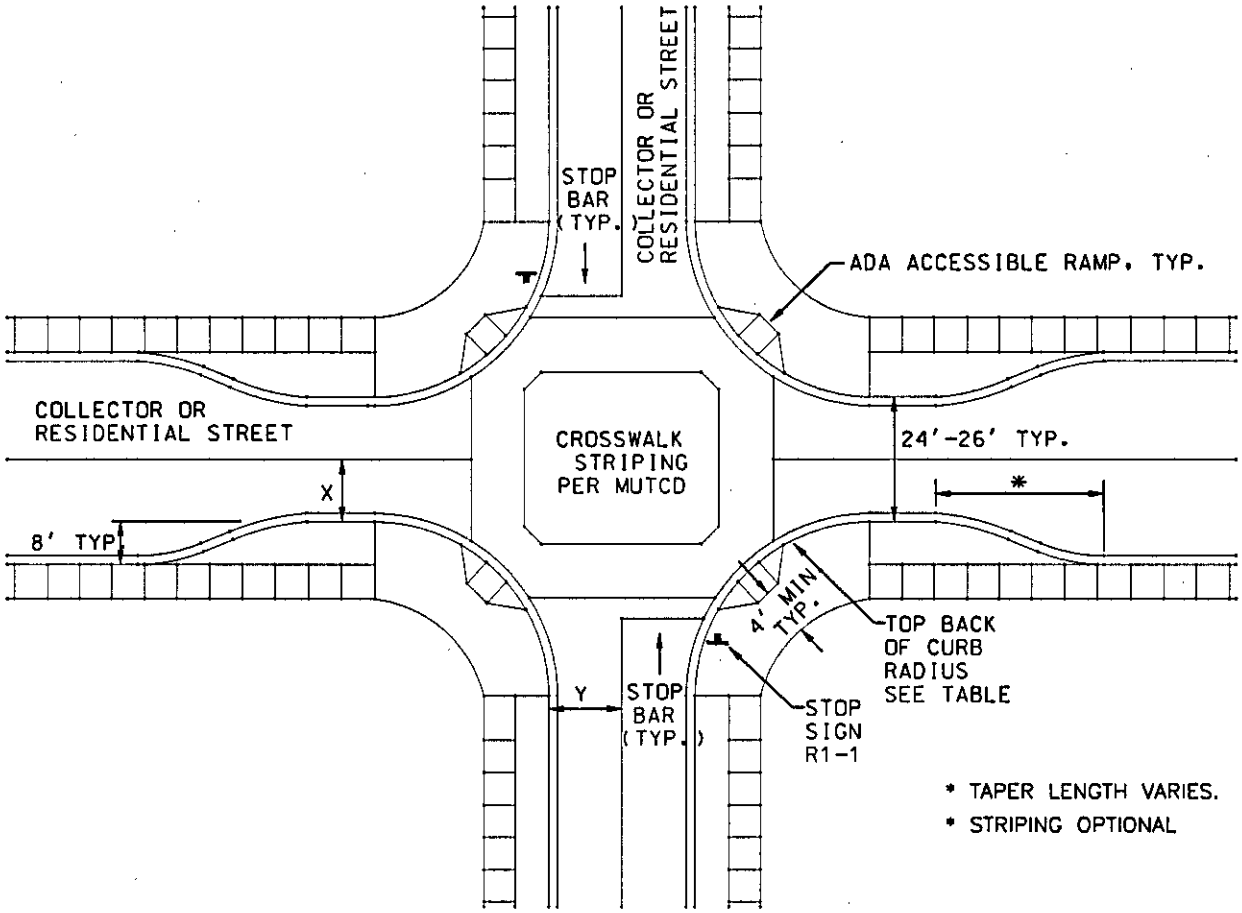
N.T.S.

REVISIONS		
DESCRIPTION	NAME	DATE

CITY OF HUNTSVILLE

NECKDOWN

DIRECTOR	DATE	ENGINEER OF PUBLIC WORKS CITY OF HUNTSVILLE, ALABAMA	TD-23



TBC TO CENTERLINE		TBC RADIUS
X	Y	
12'	12'	40'
12'	14'	32'
12'	16'	26'
14'	12'	37'
14'	14'	35'
14'	16'	24'

NEW DEVELOPMENT	EXISTING DEVELOPMENT
X	X

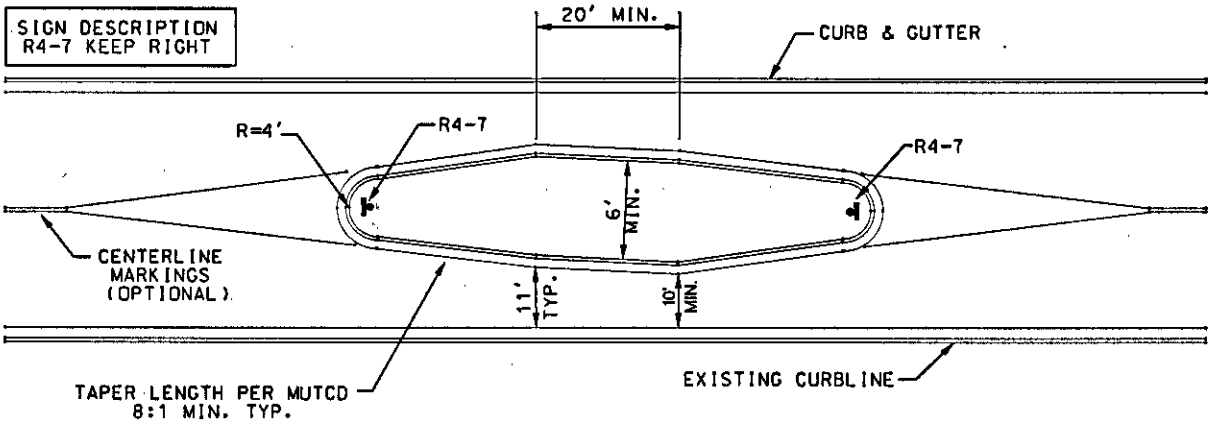
N.T.S.

REVISIONS		
DESCRIPTION	NAME	DATE

CITY OF HUNTSVILLE

TYPICAL NECKDOWN

DIRECTOR	DATE	ENGINEER OF PUBLIC WORKS CITY OF HUNTSVILLE, ALABAMA	TD-24



NEW DEVELOPMENT	EXISTING DEVELOPMENT
X	X

N.T.S.

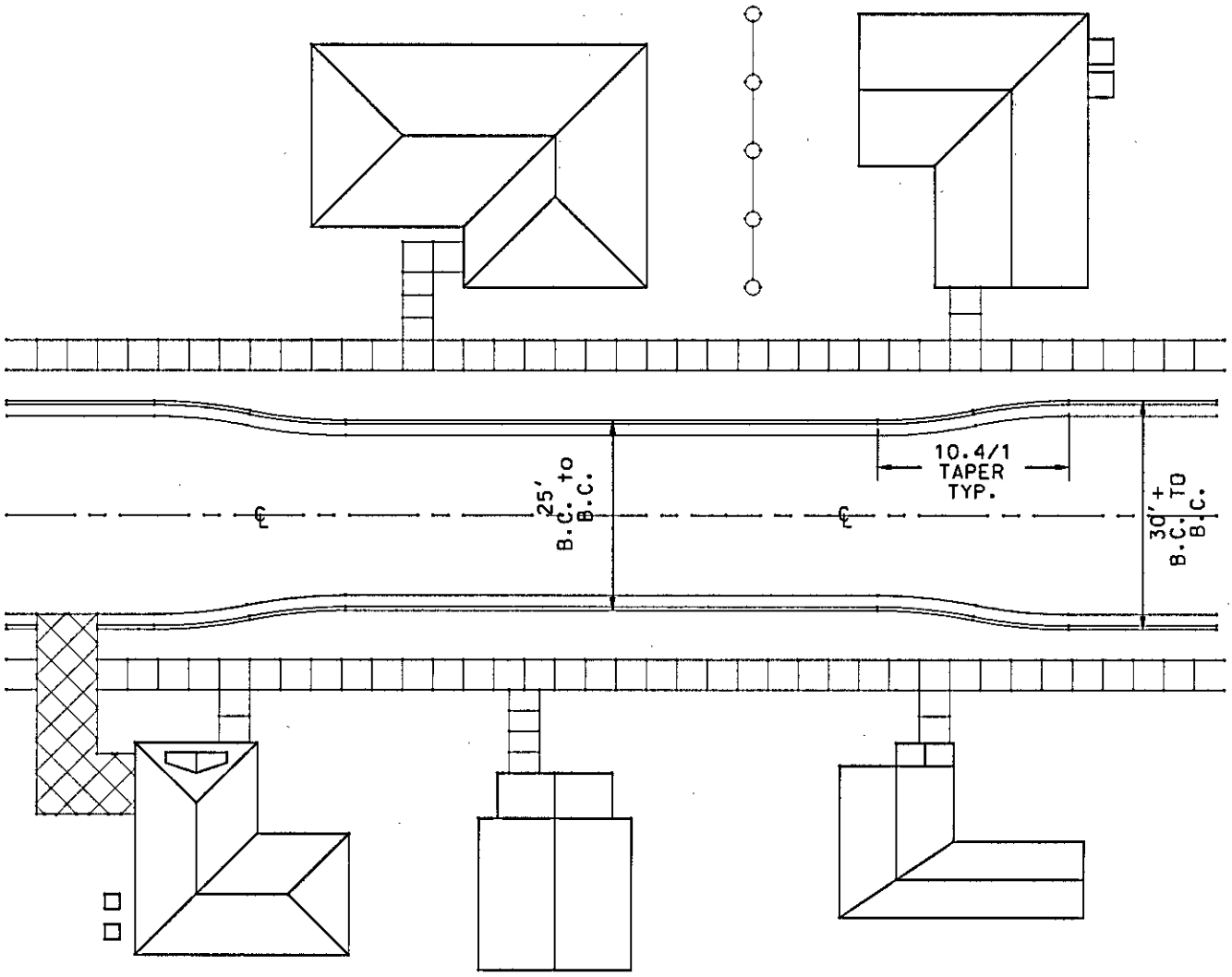
REVISIONS		
DESCRIPTION	NAME	DATE
DIRECTOR		DATE

CITY OF HUNTSVILLE

TYPICAL CENTER ISLAND NARROWING

ENGINEER OF PUBLIC WORKS
CITY OF HUNTSVILLE, ALABAMA

TD-25



NEW DEVELOPMENT	EXISTING DEVELOPMENT
X	X

N.T.S.

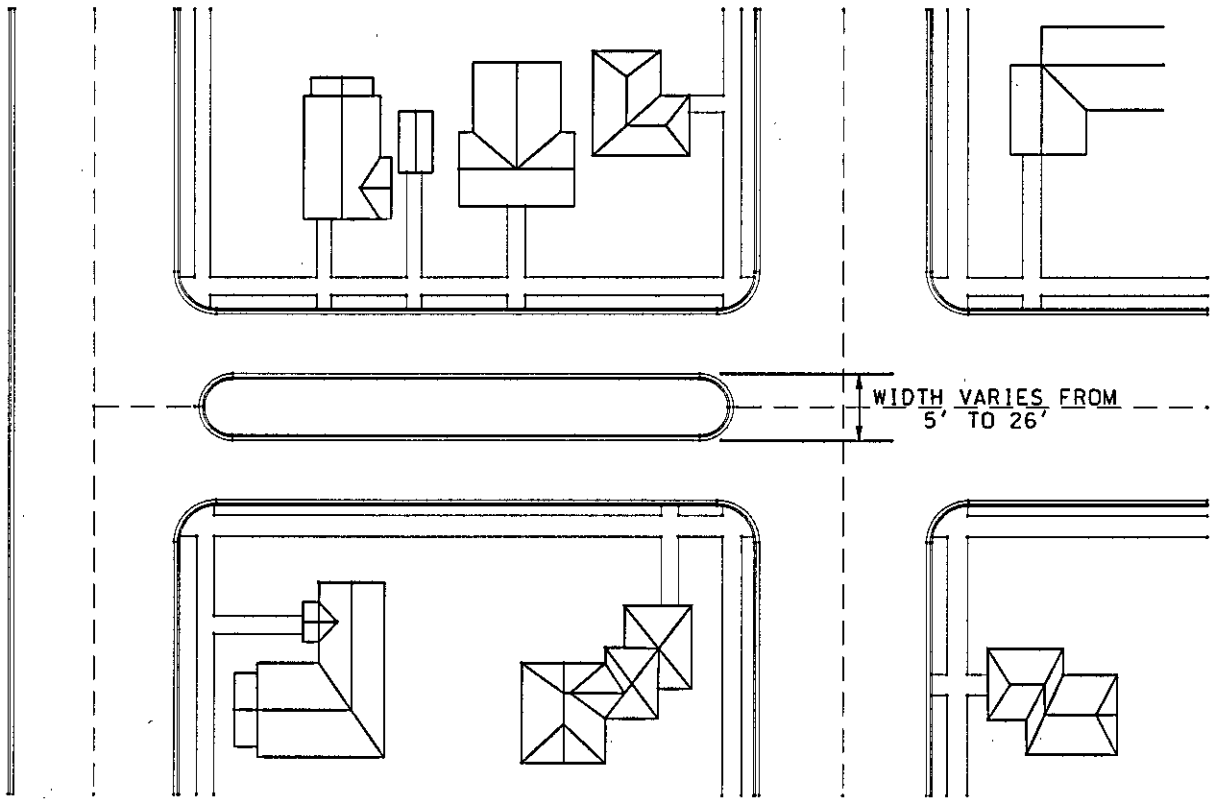
REVISIONS		
DESCRIPTION	NAME	DATE
DIRECTOR		DATE

CITY OF HUNTSVILLE

LANE NARROWING

ENGINEER OF PUBLIC WORKS
CITY OF HUNTSVILLE, ALABAMA

TD-26



NEW DEVELOPMENT	EXISTING DEVELOPMENT
X	X

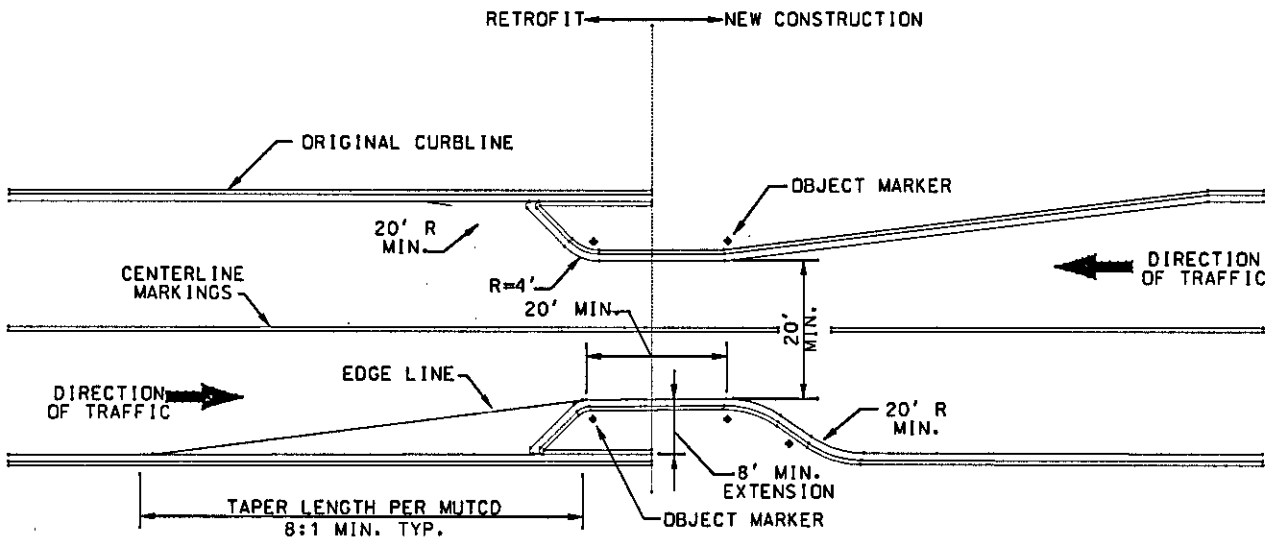
N.T.S.

REVISIONS		
DESCRIPTION	NAME	DATE

CITY OF HUNTSVILLE

MID-BLOCK MEDIAN

DIRECTOR	DATE	ENGINEER OF PUBLIC WORKS CITY OF HUNTSVILLE, ALABAMA	TD-27



NEW DEVELOPMENT	EXISTING DEVELOPMENT
X	X

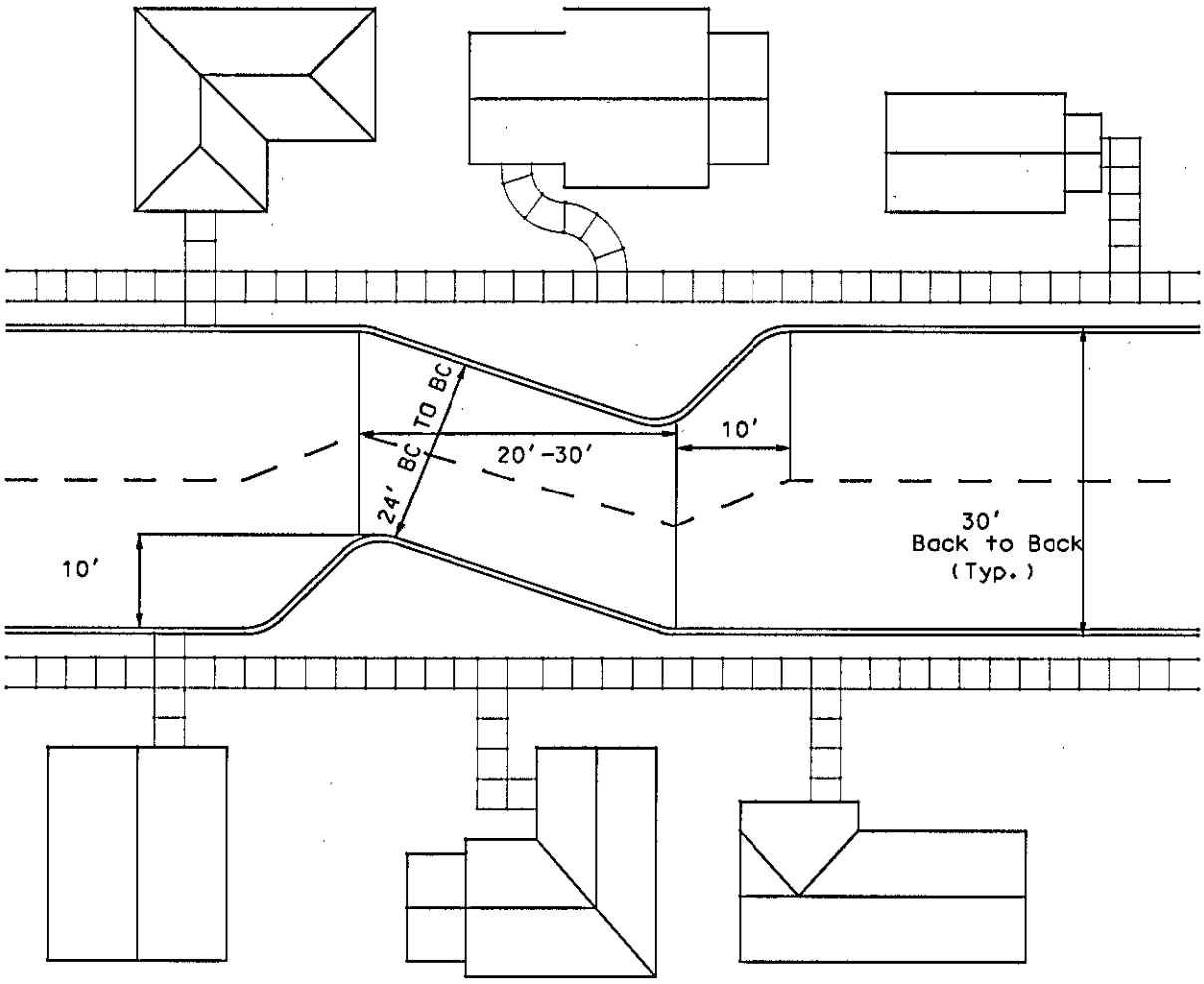
N.T.S.

REVISIONS		
DESCRIPTION	NAME	DATE

CITY OF HUNTSVILLE

TYPICAL CHOKER

DIRECTOR	DATE	ENGINEER OF PUBLIC WORKS CITY OF HUNTSVILLE, ALABAMA	TD-28



* OPTION: MEDIAN MAY BE USED TO FORCE ENTRY ANGLE.

NEW DEVELOPMENT	EXISTING DEVELOPMENT
X	X

N.T.S.

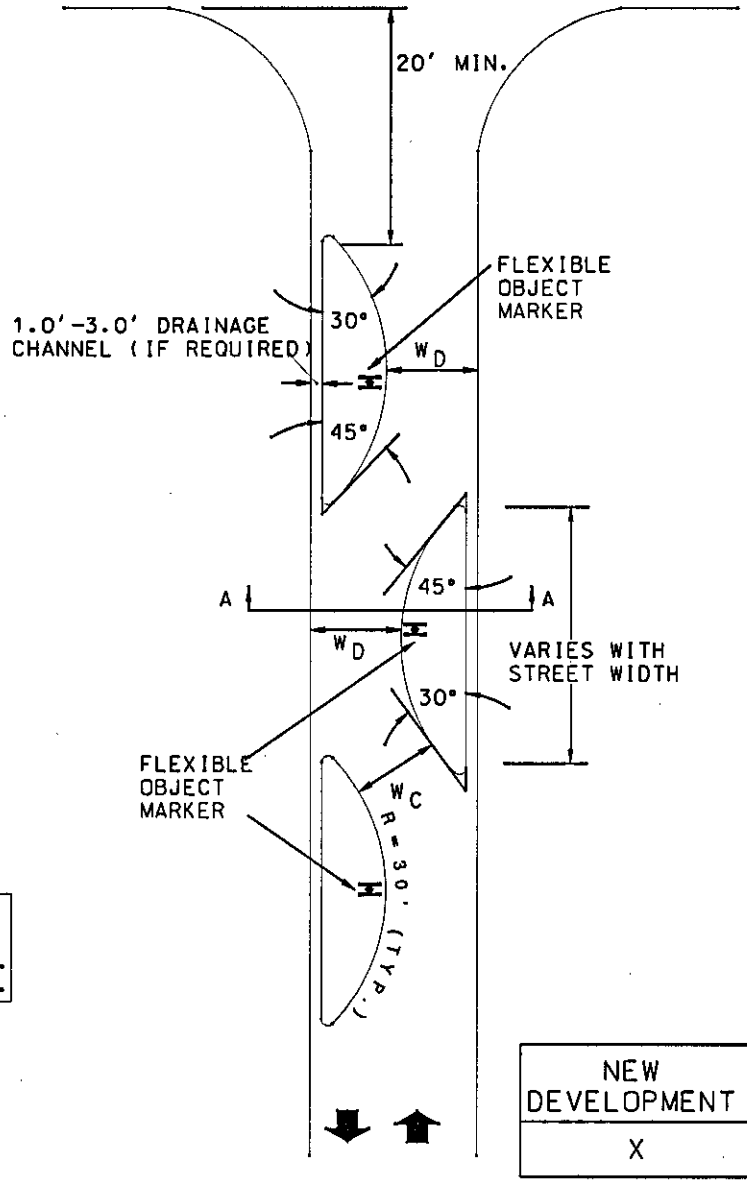
REVISIONS		
DESCRIPTION	NAME	DATE
DIRECTOR		DATE

CITY OF HUNTSVILLE

ANGLED SLOW POINT(S)

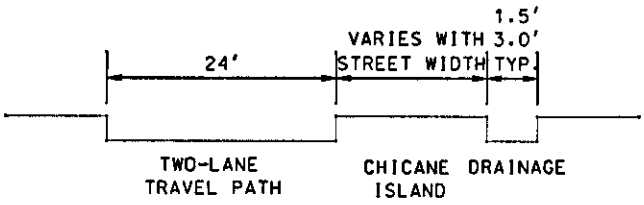
ENGINEER OF PUBLIC WORKS
CITY OF HUNTSVILLE, ALABAMA

TD-29



	TWO LANES	ONE LANE
W_D	24' MIN.	15' MIN.
W_C	20' MIN.	12' MIN.

NEW DEVELOPMENT	EXISTING DEVELOPMENT
X	X



SECTION A-A

THE TRAVEL PATH THROUGH THE CHICANE CAN BE ONE LANE OR TWO LANES AS NOTED.

SPACING OF CHICANE SEGMENTS DEPENDENT ON SITE CONSIDERATIONS. E.G. DRIVEWAY LOCATIONS.

ISLAND PLANTING SHOULD NOT OBSCURE DRIVER'S VIEW OF CHICANE TRAFFIC.

BICYCLES ARE TO USE THE SAME PATH AS MOTOR VEHICLES. NOT THE DRAINAGE CHANNEL.

N.T.S.

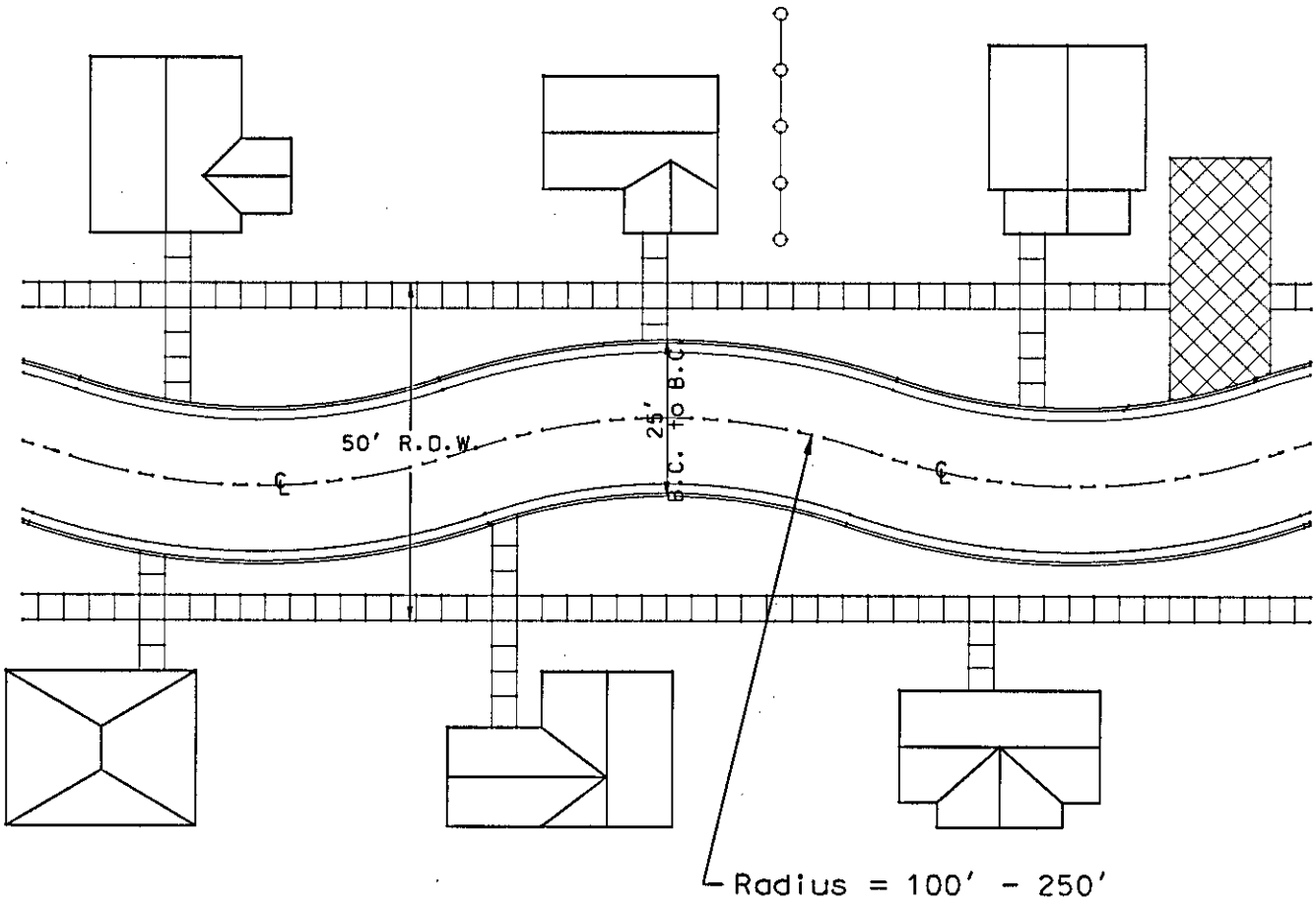
REVISIONS		
DESCRIPTION	NAME	DATE
DIRECTOR		DATE

CITY OF HUNTSVILLE

CHICANE

ENGINEER OF PUBLIC WORKS
CITY OF HUNTSVILLE, ALABAMA

TD-30



NEW DEVELOPMENT	EXISTING DEVELOPMENT
X	

N.T.S.

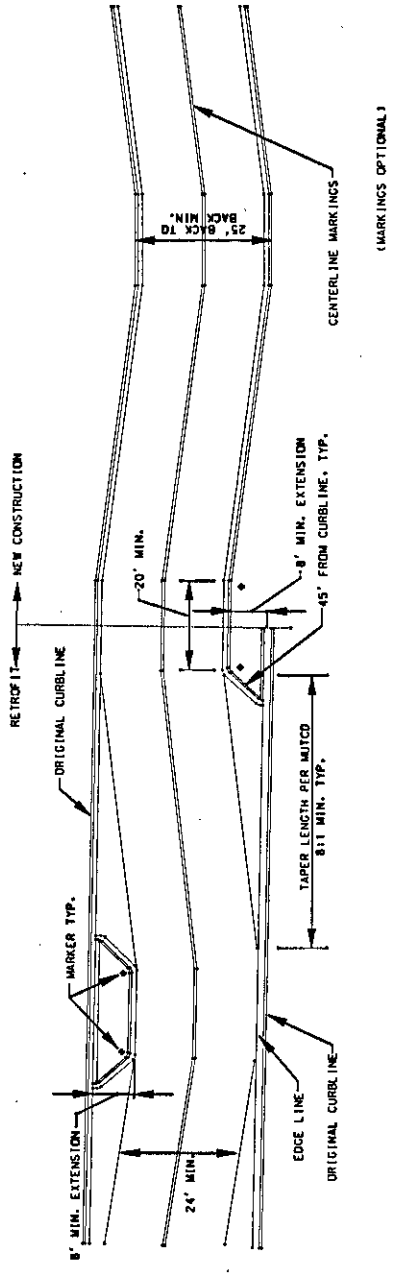
REVISIONS		
DESCRIPTION	NAME	DATE
DIRECTOR		DATE

CITY OF HUNTSVILLE

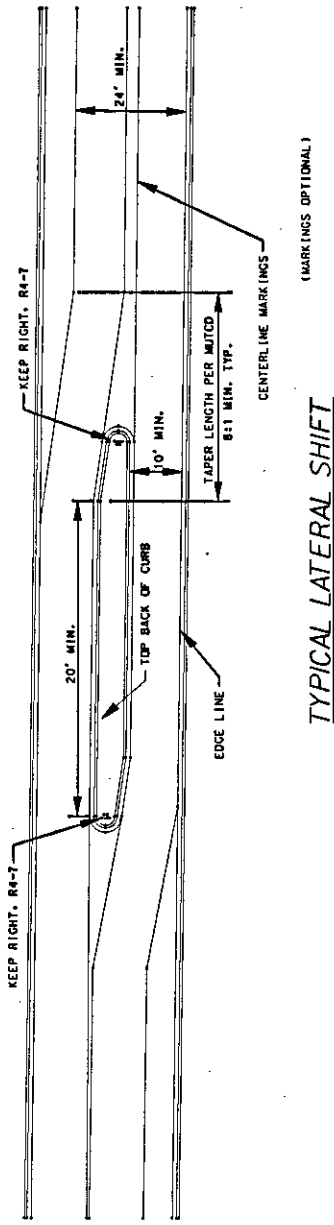
Deviation /Chicanes

ENGINEER OF PUBLIC WORKS
CITY OF HUNTSVILLE, ALABAMA

TD-31



TYPICAL CHICANE



TYPICAL LATERAL SHIFT

NEW DEVELOPMENT	EXISTING DEVELOPMENT
X	X

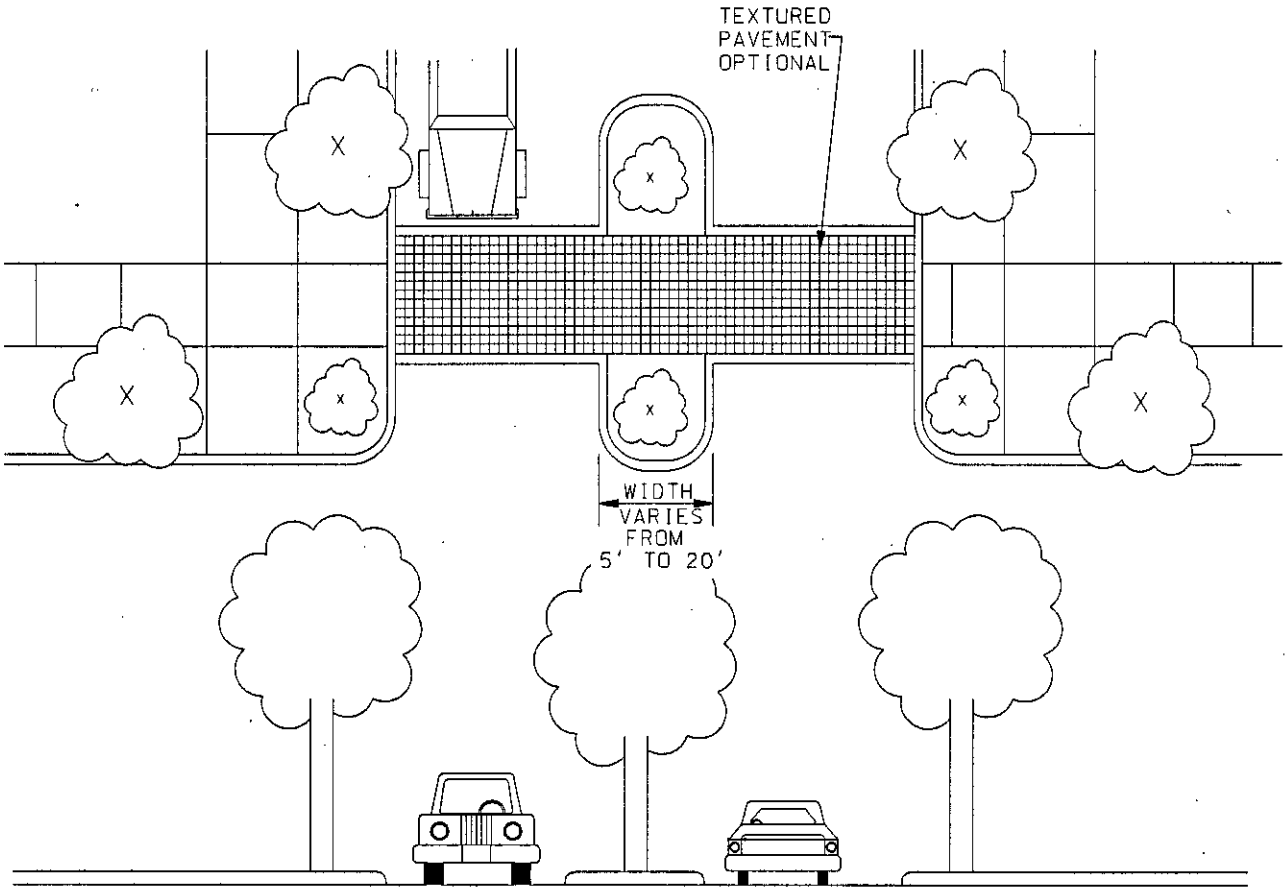
N.T.S.

REVISIONS		
DESCRIPTION	NAME	DATE

CITY OF HUNTSVILLE

TYPICAL CHICANE AND TYPICAL LATERAL SHIFT

DIRECTOR	DATE	ENGINEER OF PUBLIC WORKS CITY OF HUNTSVILLE, ALABAMA	TD-32



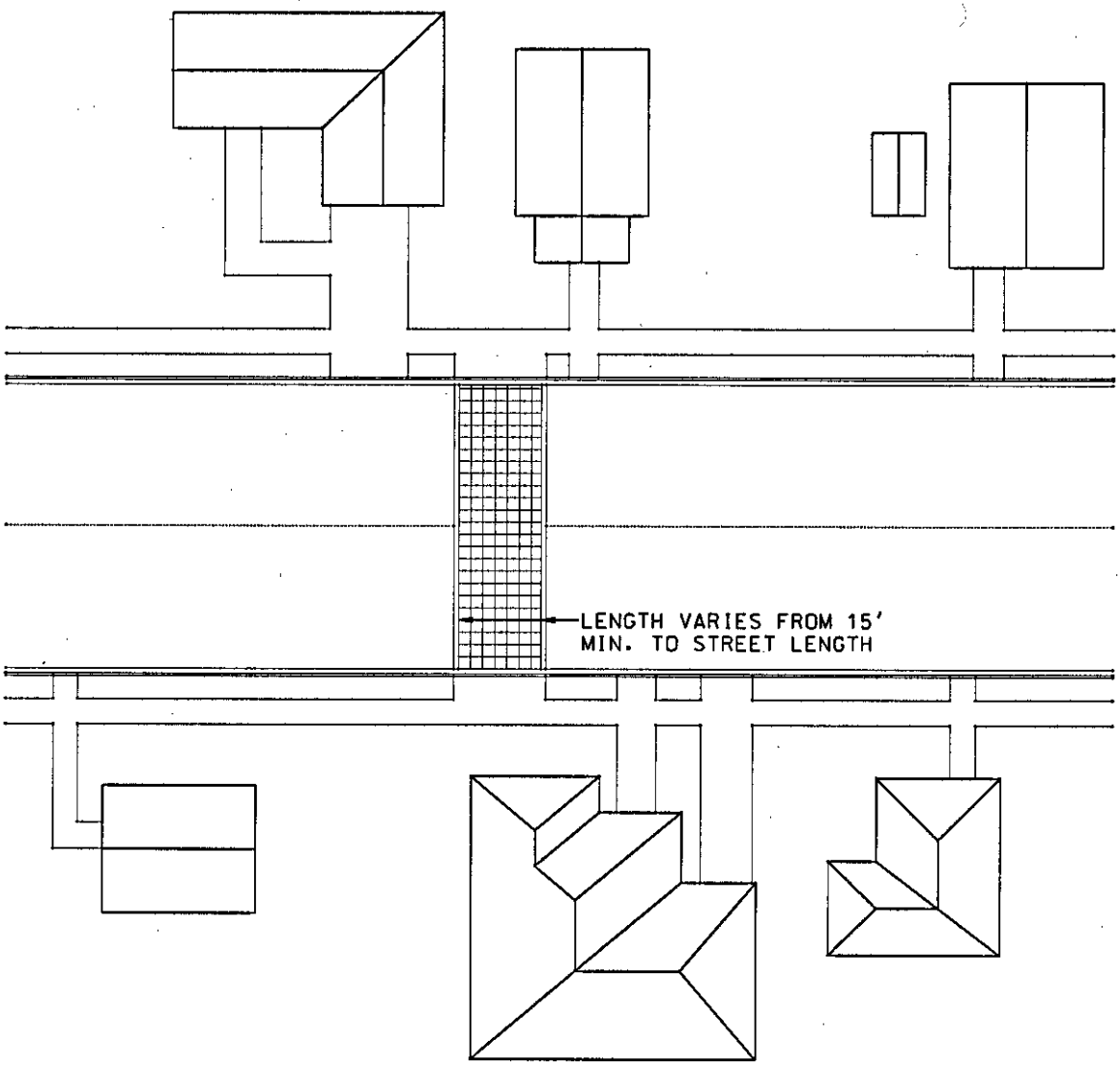
NEW DEVELOPMENT	EXISTING DEVELOPMENT
X	X

REVISIONS		
DESCRIPTION	NAME	DATE

CITY OF HUNTSVILLE

GATEWAY TREATMENT

DIRECTOR	DATE	ENGINEER OF PUBLIC WORKS CITY OF HUNTSVILLE, ALABAMA	TD-33



NEW DEVELOPMENT	EXISTING DEVELOPMENT
X	X

TEXTURE MAY BE STAMPED BRICK, SCORED, COBBLESTONE, ECT.

N.T.S.

REVISIONS		
DESCRIPTION	NAME	DATE
DIRECTOR		DATE

CITY OF HUNTSVILLE

TEXTURED PAVEMENT

ENGINEER OF PUBLIC WORKS
CITY OF HUNTSVILLE, ALABAMA

TD-34